

YOUR COMMODORE

OCTOBER 1988

£1.20

IRREGULAR ADD-ONS a round-up of unusual accessories

Games Reviewed:

Dark Side

Football Manager II

The Games—Winter Edition

Netherworld

Fernandex Must Die



Alarm—programmer's time out

UNBEATABLE PROGRAMS:

JOYSTICK CURSOR ☐ FILE EXTENSION ☐ HI-RES FILL ☐ CODE RELOCATION

The price of coming first at the Olympics

COMMODORE 64
OLYMPIC
challenge
£149.99



gfirst

If you weren't selected for the Seoul Olympics, no need to feel out of the running.

Because everything you need to compete in all the events is right here with the Commodore 64 Olympic Challenge pack. And at only £149.99, your gold medal's practically in the bag.

Here's the C64 Olympic line-up...

- * **C64 Computer**, the latest version of the world's best-selling computer.
- * **Cassette unit**, for simple loading of programs.
- * **Joystick** to put you in complete control of screen action.
- * **Plus all the excitement of 10 great sporting games.**

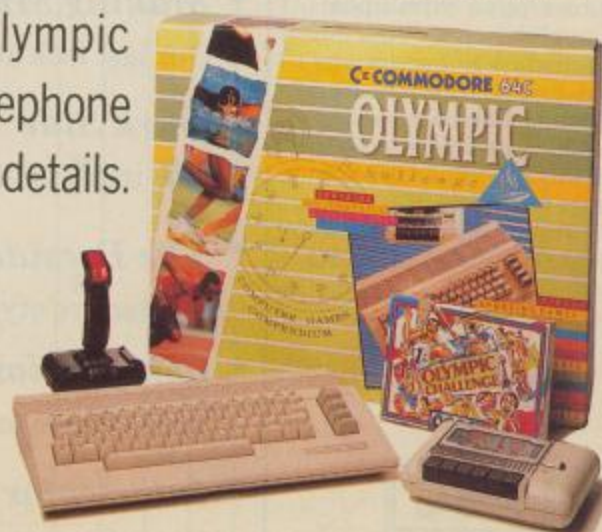
On day one, you can use all your skills and reflexes to race against the clock in the track and field events. Or take up the challenge of world series baseball, weightlifting, football, tennis and the championship title fights.

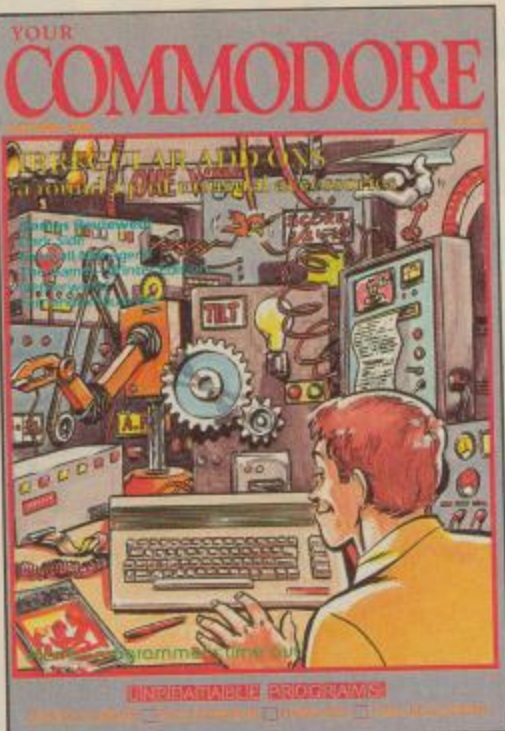
And when the Olympics are over, you can then go out and grab the best beat 'em ups, one-on-one, adventure and simulation games that really come alive on the C64.

There's only a few days to go before the opening ceremony, so make a dash for your local dealer and ask about the C64 Olympic Challenge pack. Or telephone 0800 800 477 for more details.



Commodore





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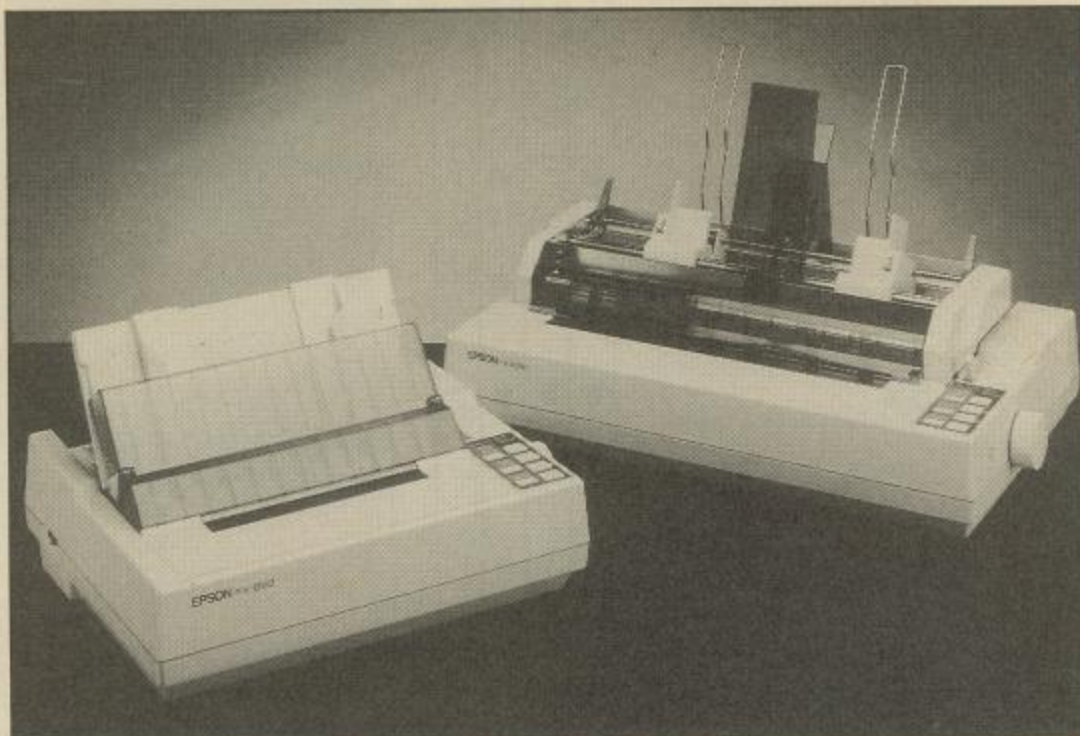
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Epson add special effects to the FX

FX Parking Permit

The Epson FX850 and FX1050 printers have been upgraded to incorporate a paper parking facility.

The new units, which retail at £459 and £599 respectively, can now be used with a minimum of fuss when continuous stationery is swapped for sheet feeding. Instead of unlacing the tractor feed manually, new owners can just flick a lever and press a switch. The actions automatically withdraw the paper out of the printer's paper path but the tractor sprocket remains

engaged. This means that, after the sheet feeding has been completed, tractor feed can be resumed without the need to relace the paper by hand.

The machines also feature three internal character fonts, 246cps draft and 54cps NLQ speeds, all done with less than 55dBA of noise.

Touchline: Epson (UK), 388 High Road, Wembley, Middlesex HA9 6UH. Tel: 01-902 8892.



Ingrid, star of Level 9's Gnome II

Level Gnome

At Level 9, Gnome is where the heart is and to prove it Ingrid's Back. The diminutive star of Gnome Ranger returns to battle against Jasper Quickbuck in Gnome II.

Quickbuck is planning a Yuppie Homes development in a quiet corner of the gnome counties. Only one thing stands between him and his dreams of suburbia — Ingrid Bottomlow and her accident prone ways.

Also nearing completion is Pete Austin's megaproject Lancelot. After months of research, Austin has combined hi-tech programming with Mallory's Morte D'Arthur to produce a three part adventure which follows Lancelot's knighting, his fall from grace with Guinever and the search for the Holy Grail.

Touchline: Level 9, 5 Mendip Road, Crown Wood, Bracknell, Berkshire RG12 3XG. Tel: 0344 487597.

Arts Trek

Electronic Arts are releasing the 'Wargame of the Century' and its simply called Empire. The objective is to search out alien lifeforms and blast them to bits.

This may sound like a corruption of Star Trek so far but there's more. The player takes the roll of Captain William P Brown of the UGAS Britannia, an enterprising chap who wishes to seek out the evil Krellans who cling on to large tracts of real estate known as the Krellan Empire.

William P Brown has to boldly go into the heartlands of the Krellans, completely phase them into submission and escape scot free as he checks off another conquered world, leaving bare bones and shouting a battle cry of 'Ooh, hurrah!' at the death of the Krellans. Then, realising that he spoke too soon, he heads off into uncharted space to do battle once more.



Michael Powell EA's first UK programmer

Empire is a one to three player game of strategy in which the winner is the last to survive.

The second up and coming release from EA is Powerdrome which has the distinction of being the first EA game to be penned entirely in the UK.

This November launch for the Amiga features solid 3D graphics of a jet racer championship of the future. The Powerdrome series consists of six races, each at different tracks which feature differing weather conditions.

A special feature is included in the two player game which requires two Amigas to be linked together. Once the union is made, the two combatants can race against each other after tuning up and getting a suspensor grid position through speed trials at the start of the race.

Touchline: Electronic Arts, 11-49 Station Road, Langley, Berkshire SL3 8YN. Tel: 0753 49442.

Gung Ho Prose

Glasnost is a word which doesn't appear to feature in Wild Bill Stealey's vocabulary down at Microprose HQ. Once more it's time to loose the dogs of war on the Commie threat as Red Storm Rising makes a transition from book to game.

Tom Clancy's best seller concerns events in a future world war between the Russians and Americans in which a lone nuclear submarine has the task of wiping out the USSR's underwater fleet.

Microprose's leading programmer and designer, Steve Meier, has been given the task of converting words into bytes. Meier promises that the new simulation will be far more advanced than Microprose's highly acclaimed Silent Service.

In the meantime, the PC Show's centrepiece was provided by Micro-



Microprose's PC Show stopping Super X flight simulator

prose in the form of a highly advanced simulation machine. The Super X Prokon flight simulator combines sensitive mechanical control with a wide angle computer generated visual

display to give its 14 passengers the sensation that they're really flying.

Touchline: Microprose, 2 Market Place, Tetbury, Gloucester GL8 8DA. Tel: 0666 54326.

Vive la micro

The French are preparing for their second Festival de la Micro show on 14-16th of October at Espace Champ-erret, Paris. This is only the second year that the show has been held but it is rapidly establishing itself as the Gallic equivalent to the PC Show.

The festival is hosted by Neo Media press group and it was developed through necessity rather than by design. Neo Media organised an Amstrad show in 1986. It proved so successful that Amstrad France decided to run the show themselves by registering the name Amstrad Expo and forbidding Neo Media from using the Amstrad name.

Jean Kaminsky, Neo Media's managing director and show organiser, was not deterred so easily and in October last year the Festival de la Micro attracted over 20,000 visitors. Apple, Atari, Amstrad, Commodore and Sega all took stands at the show and they will also be there again this year.

The only question that remains is whether Amstrad will be the biggest draw again this year or will Commodore or Atari pull the larger share of the crowd?

Touchline: Festival de la Micro, Espace Champ-erret, Porte de Champ-erret, Paris

Organiser: Neo Media, 5-7 Rue de l'Amiral Courbet, 94160 Sainte Mande.

PC Plod

Commodore are to be commended for sticking with their PC compatibles and at last persistence may be paying off. With their prices at an all time low, the company is now promoting its discount schemes for educational establishments.

Under the scheme, PCs retailing at £315 (mono) and £430 (colour) are being supplied for £299 and £369 respectively. At the top end of the range the savings are even greater with PC60-80HD Enhanced Colour Display 80386 clone costing £4299, a saving of £1160 on the normal RRP.

Now that prices have come down

so far, it could be time for schools to re-examine their microcomputer policies with a thought to using the industry standard PC instead of the charming but remote BBC Micro. The fact that the PC is used in almost every computerised establishment would give the computer student a distinct advantage in gaining employment when cast from the academic world into that of commerce.

Touchline: Commodore Business Machines (UK) Ltd, The Switchback, Gardner Road, Maidenhead, Berkshire SL6 7XA. Tel: 0628 770088.



Is it time Commodore's PC1 went to school?

COMMUNICATIONS CORNER

One major problem associated with calling bulletin boards is the cost of the call. Not only that, but many BB numbers published in magazines and on BB's do not state the location of the BB itself.

A new facility available to MicroLink subscribers can now solve that problem. Called STD, users either enter the name of a town/city, or a dialing code and the exclusive of the two will be displayed.

As an example, entering '0424' will result in 'Hastings' being displayed. Alternatively, entering 'Hastings' will result in '0424' being displayed.

At the time of writing the service does not incorporate area codes within a city but this will be introduced at a later date. International dialing codes and associated country names will also be introduced.

Prestel/Micronet subscribers have a similar facility within the British Telecom database on Prestel. Located at page 383614 is an area code locator. This is used by entering the first three digits of the area code. This will display a list of the areas covered by that exchange. Major cities are covered, so it is possible to get a breakdown of area codes within a major conurbation such as London.

The Price of Microlink

Shortly after the new Tariff changes for Prestel/Micronet were announced, MicroLink issued a statement that it would not be increasing its prices.

However, it appears that even though MicroLink charges have not gone up in the last three and a half years, the operational costs have. In a letter to all subscribers, Derek Meakin, MD for Database Publications which operates MicroLink said that the company could no longer subsidise its customers. As a result, the minimum monthly standing charge of £3 has been increased to £5. This brings the standing charge in line with the rest of Telecom Gold.

In the letter Meakin also promised a number of enhancements to MicroLink, including the addition of yet more gateways both national and international.

Your Commodore notes that MicroLink still represents excellent value for money. Not only does it offer a comprehensive range of facilities

Our roving reporter David

Janda is back with more

*news and views in the
world of comms*

beyond what Telecom Gold provides, but MicroLink subscribers do *not* have to pay any block data transfer charges. The data transfer charge was introduced in August 1987 and is a charge for every 512 character-block of data sent/received to/from Telecom Gold.

The Magazine Grows!

Xtra! The magazine supplement area on Micronet has a new section called Voltage.

The area will cater for those interested in Hi-fi and consumer electronics by providing the readers with news, reviews and features on the latest gadgets for the Hi-tech yuppies among you.

Voltage will be updated on a regular basis and reading it incurs no extra charge for Micronet subscribers. Prestel only subscribers can read Voltage, but are time charged at different rates depending on what time of day the section is read.

The Deamon Dies!

Dataphone Ltd of Peterborough is no more. The company manufactured and sold modems including the Demon II and the Designer.

According to former MD Martin Payne the company was under financial stress for some time. It is understood that extensive delays in obtaining BABT approval for the Demon II and Designer modems contributed to the companies problems.

New backing in the form of a company called Modem Marketing has been sought and the new company will be selling Dataphone products.

Micronet on the Move

Telemap Group Ltd, who's primary product is the Micronet database on Prestel is to move its HQ from London to Apsley near Hemel Hempstead. The move which will be made early 1989 will result in Telemap sharing office space with Dialcom UK. Dialcom is

part of British Telecom and incorporates Prestel, Telecom Gold, and a host of other value added services.

According to Micronet the move will result in better communications between The Net and Prestel.

However, *Your Commodore* has received information from several reliable sources who suggest that British Telecom (who currently have a 40% share in Telemap Group Ltd) will buy out the two other Telemap share holders. These are EMAP and Bell Canada.

This would be a logical move on BT's part as it would mean that Micronet (which is the largest IP on Prestel) would be under its control.

Although this information has not been confirmed by the top management at Telemap (who were not available for comment) this writer believes it to be the case.

More Amiga Coverage

Editorial coverage for the Amiga on Micronet has been rather thin until now.

Before, coverage was supplied by the contributors of the 16/32 area. This has all changed as the Solely CBM area provides information for Amiga owners as does the ST/Amiga area which now has a full time member of Micronet's staff writing for it.

At present, there is no separate microbase on Micronet for Amiga owners, but this may change if the number of Amiga owners subscribing to Micronet increases.

Gateways from Microlink (c) Database Publications

- 1: Mnemonics
- 2: Echo
- 3: AIMS Database
- 4: Infocheck
- 5: Jordan Watch
- 6: Official Airways Guide
- 7: World Reporter
- 8: FinTech - Financial Times Pubs
- 9: Petroleum Monitor
- 10: Lotus
- 11: Kompass
- 12: BIS Infomat Newsfile
- 13: Wall Street Journal
- 14: Grants to UK Industry
- 15: Marketing Week

1-15 R(edisplay Q(uit Select :

THE MIDLAND'S LARGEST COMPUTER STORE

[illegible]

Gizmos - expanding Commodore

By Tony Hetherington

For a lot of Commodore users 64K of memory, a joystick and a good selection of games will be enough to occupy all their computing time. But, for others who see their C64 or C128 as a means to explore the world of sound, graphics, teletext and even robotics will find the following pages an invaluable source to all add-ons, gizmos, cartridges and circuit boards that you can use to expand your Commodore.

As with other fields in computing the world of Gizmos is almost totally dominated by a single company. If you think of adventures you think first of Infocom, if you're looking for a printer Epson spring to mind. Similarly in the world of Gizmos, Datel Electronics is the name.

Although Datel still has competition in many areas, its success is a fine example of the potential success waiting for third party companies that are prepared to support machines. Without these companies the C64 and C128 would be good but limited machines and would not enjoy their current success and appeal. Compiling this article has convinced me that whatever the task you wish to embark on with your C64 or C128 there's likely to be a piece of hardware and software available somewhere that will make it a whole lot easier.

Chips and Boards

Chips and circuit boards are an obvious way of expanding your Commodore as they can add to or replace your computer's hardware. You may need some basic knowledge of electronics and be competent at soldering to get the best out of them, however there are some that simply plug into the cartridge port so even the most inexperienced novice can uncover their secrets.



Turbo ROM II/Datel Electronics/£14.99

This chip replaces the C64s ROM with a turbo version capable of loading and saving programs five or six times faster than normal, and adds a ten second disk format routine and programmed function keys that provides functions such as load and directory and the touch of a key.

4 Way Kernel Board/Datel Electronics/£12.99

This board slots in and replaces the kernal and provides an adaptor that can take 16K or 32K replacement ROMs and a switch so you can swap between the systems.

256K Superom Expander/Datel Electronics/£29.99.

dig your or Commodore Comm

Possibly the ultimate in ROM expansion as this expander board has eight slots each capable of carrying a 32K EPROM. The board also is supplied with its own menu driven operating system so you can access any of the eight EPROMS without loading in a program.

An EPROM generator utility will convert your own BASIC or machine code programs and turn them into autostart EPROMs.

In effect the Superom expander provides a neat alternative to hordes of cartridges protruding from your C64 as 2764, 27128 and 27256 EPROMs can be switched in and out as required giving you a suite of instant menu accessed programs.

Eprommer 64/Datel Electronics/£39.99.

The Eprommer 64 is the ideal companion board for the Superom Expander as it can be used to program 2716, 2764, 27128 and 27256 chips.

Menu driven programs allow you to program, read, verify and copy EPROMs simply so that they're ready for use in the Superom Expander.

The Drive Box/F.S.S.L./£19.95.

The Drive Box once soldered in will allow you to alter the drive number (8, 9, 10, 11) of your 1541, 1571, 1570 or 128D disk drive and also write to the backside of a disk without cutting a notch in the disk as it bypasses the write protect sensor.

1764/F.S.S.L./£99.95.

A plug in memory expansion board for the C64 that will add 256K to your computer in four 64K banks. Supplied with its own power supply the 1764 won't drain your C64 and will give you the extra memory needed in so many development projects.

1750/F.S.S.L./£149.95.

512K is available in this the C128

version of the F.S.S.L. memory upgrade board.

Graphics

The Commodore's graphics facilities are the envy of other 8 bit owners who cannot hope to match the quality and colour of C64 graphics. The following packages help you to make the most of these facilities through a combination of hardware and software.

Blazing Paddles/Datel Electronics/£24.99.

A combined lightpen and graphics package system that promises to help you get the most out of your Commodore's graphics potential.

The fibre optical lightpen plugs into the joystick port and is ideal for creating computer art as you can simply point to the part of the screen you want to work on. Add to that a software package that includes windows and icons for ease of use and features such as rubber banding, zoom modes, a range of brushes, the ability to cut and paste windows, load and save shapes, windows and screens and a colour mix over 200 hues and the result is a must for computer artists.

Stop Press/AMS/£79.95.

Stop Press is one of the better C64 Desktop Publishing packages mainly due to the inclusion of the excellent AMX mouse.

By moving the mouse and pressing one of its three buttons you can select from the programs pull down menus and create graphics and page styles in which you can paint on text created by a separate word processor. In a recent survey of Commodore Desk Top publishers in the last *Your Commodore* Stop Press scored well. It's success partly due to the easy to use software and partly to the AMX mouse that would top any mouse

comparison table. Together they made headline news.

BASIC 8/F.S.S.L./£34.95.

This is an incredible package for the C128 which together with F.S.S.L.'s 64K Video RAM upgrade kit (£19.95) unleashes unimagined graphics power that can even rival the 16 bit machines.

BASIC 8 adds over 50 commands to C128 Basic that allows you to draw a circle, box or 3D solid shape with a single command and includes commands to control windows, create fonts, and select patterns and brushes.

The result of your programming can be displayed in 80 column mode and in mono a resolution of 640 x 200 and 640 x 192 in 16 colour mode.

Sound

Computer sound can be one of its most impressive features but few C64 users are able to make the most of their computer's features. Although there are a number of excellent music packages on the market somebody serious about computer music should check out the sounds of science created by these samplers, midi interfaces and electronic drum systems.

Digital Sound Sampler/Datel Electronics/£49.95.

Sound samplers can be great fun to use as you can record or sample any sound or noise and record it in memory. Once it's there you can speed it up or slow it down, play it back forwards or backwards and add echo, reverb or ring modulation to create an amazing range of results that can be saved for later use.

The Datel Digital Sound Sampler comes complete with a microphone and allows you to store and edit up to eight samples at any one time making it a powerful sound editing

tool whether it is just amusement (making your Granny sound like anything from John Wayne to a Dalek), to mimic the sampled sounds of today's records or to create sound effects for stage and radio.

Com-drum/Datel Electronics/£29.99.

The Com-drum plugs into the cartridge port of your C64 and turns it into a digital drum machine.

Through a menu driven editor you can create drum rhythms in real or step time and store up to eight drum sounds in memory and save them to tape or disk and then play them back through your hi-fi.

A separate Com-drum editor (£4.99) provides the Com-drummer with a disk full of 24 drum sounds that you can combine and edit to provide your own customised drum kit.

MIDI 64/Datel Electronics/£29.99.

MIDI is one of the buzzwords of the 80s and in this case stands for Musical Instrument Digital Interface that can transmit notes and how they are played (duration, pitch etc) to a storage device or an instrument.

For a basic MIDI system you need a keyboard, synthesiser, MIDI interface and computer. Casio is probably your best source of keyboards and synthesisers, your C64 will prove to be an adequate computer and this a suitable interface between the two.

Cartridges

The Commodore family of computers is one of the few that uses cartridges to expand and improve the original system. The cartridge has an obvious advantage over disk or solder in ROM alternatives as they simply plug into the cartridge port and are instantly ready for use.

Unfortunately, the good name of cartridges has been slurred by people who still insist on driving up the price of software by copying programs for friends. The cartridge companies have also fallen into this trap and base their advertising on how quick they can backup the latest releases.

However, now the companies are fighting back by maintaining that their

cartridges are programming tools and I would add that every user has the right to backup his software or create a disk version of a tape game as long as it is for his own use. Piracy simply pushes up the cost of programs.

Action Replay IV Professional/Datel Electronics/£34.99.

This is the updated version of possibly the best known cartridge and adds to the features of the original compactor, backup, turbo loading, sprite killing, printer dumping original by adding an onboard custom chip that includes an extended monitor that can freeze any program allowing the serious programmer to disassemble, compare, fill, transfer, hunt, relocate and jump to any part of the code and the restart the program from the place you froze it.

This can provide an educational tool for programmers who want to find out how their mentors created a certain effect.

Final Cartridge III/Datel Electronics/£39.99.

The latest version of the Final cartridge gives your C64 or C128 user a friendly front end as you control everything through windows and pull down menus.

You can turn your joystick into an auto fire stick, kill and disable sprite collisions, freezes games to create screen dumps, includes a sprite and character editor and a programmer's toolkit incorporating commands such as Auto, Renumber, Delete, Trace, Append and Dump. Add to that a calculator, real time clock, notepad and turbo loader and you have a force to be reckoned with.

Expert Cartridge/Trilogic/£29.99

The Expert differs from the other commercial cartridges since it contains RAM and not ROM chips. Although this means you must load in the operating system from disk every time you use it, you can easily and cheaply upgrade the system by changing the disk which costs about £3 and not £30 which would be the cost of a new cartridge.

Smart Cart/Datel Electronics/£29.99.

The Smart Cart is a battery packed 32K RAM cartridge that acts like a ROM cartridge. Although more technical programmers can take advantage of its I/O slots, most users will be more than happy with the way they can load their programs into memory, flick a switch and then for the next five years (until the battery runs out) reload their program in a few seconds.

An 8K version is also available at half the price which makes the 32K version a better buy as well as being more useful.

RAM Disk/Datel Electronics/£9.99.

RAM disk turns your Smart Cart into a 32K RAM disk capable of instantly storing and retrieving files and programs. Through simple commands such as load, save, directory and scratch you can access this storage area as if it was a disk drive with the only difference being that the programs load and save instantly.

3 Slot Motherboard/Datel Electronics/£16.99.

This simple device will save the wear and tear on your cartridge port as it contains slots for up to three cartridges that can be switched in and out as required. So if you've finished using the Final Cartridge you could switch to the Smart Cart Action Replay IV.

64 Doctor/Trilogic/£18.99

Here's a cartridge with a difference as the 64 Doctor is a diagnosis cartridge which examines your C64 and reports back with any problems it finds. In all it performs tests on the keyboard, serial port, cartridge port, kernel ROM, video chip and video banks, NMI and I/O interrupts, cassette data, joystick ports, user port, BASIC ROM, CIA chips, sound chip, cassette key press and even tests out your joystick.

This cartridge was developed by Trilogic as a result of its own work in repairing micros and is designed to produce an accurate diagnosis which will cut down the time and cost of repairs.

Trilogic also produces the Drive Doctor (£14.99) and Datasette Doctor (£8.99) to help you resolve tape and disk loading problems.

Robotics

Robotics is a growing area of interest enjoyed by more enthusiasts every year. Driven on by images of robots in science fiction films they strive to control the outside world from their keyboards. The C64 can be used to experiment in this area with these three Datel packages. They're still light years away from C3PO or R2D2 but it's a step in the right direction.

Robotarm/Datel Electronics/£49.95.
This robotarm has five axis of movement which can be controlled by two joysticks or via the Robotarm interface (Datel £24.99) to your C64 through which you can train or program it to create movement sequences.

Four different attachments can expand its use as you can give your Robotarm fingers, a shovel scoop, jaws or a magnetic attachment.

Robotek 64/Datel Electronics/£39.99.

Robotek 64 is a combined hardware and software package that allows your C64 to talk to the outside world. Four output channels, four input channels, analogue input with full 8 bit conversion and voice input will allow you to experiment with controlling robots and models.

Extras

In any article of this type you quickly run into gizmos that refuse to fall into any predefined categories and they usually end up getting lumped together at the end. This article is no exception so here is a collection of gizmos including a natty little joystick, a teletext adaptor and two add-ons for those Commodore users that are upgrading to the Amiga.

Icontroller/Suncom (Microprose)/£11.95.

The Icontroller is a tiny joystick (little more than an inch high) that sticks on top of the C64 or C128 and plugs

into one of the joystick ports but through a second 9 pin adaptor leaves the port free.

This mini stick is ideal for application programs such as GEOS or graphics packages but not for what the instructions describe as "the emotional movement involved in playing certain games".

Commodore 1581 Disk Drive/F.S.S.L./£184.95.

A new disk drive for the C64 and C128 that offers 1 megabyte of memory (800K formatted capacity), 3160 blocks and an impressive 8000 characters per second loading rate.

1571 FIX ROM/F.S.S.L./£24.95.

Developed by Commodore Inc USA this plug in ROM solves most of the many problems faced by 1571 owners whether it be Device not Present errors or problems when using Superbase.

Teletext Adaptor/Microtext/£79.95.

Teletext pages such as those found on BBCs Ceefax and ITV's Oracle service provide a wealth of information ranging from football results to recipes, to weather reports to latest currency and stock prices. Now, with the Microtext Teletext adaptor you can call up the pages on your C64 screen and save the pages to tape or disk.

You can also print them out for future reference and write your own programs that can read the information from the screen buffer and use it in calculation. Applications for these vary considerably from easily inputting a week's football results into a pools predictor to plotting the fall in the pound or predicting the right time to buy shares in a depressed market.

There have been teletext adaptors for computers before but few have been as cheap as this one as it not only connects to your C64 but also to your video recorder and uses its tuner to receive the teletext data. If you haven't a video, and according to Microtext most computers owners have one, you can buy a tuner as well which will increase the combined price to £124.95.

Printlink/Trilogic/£34.95.

Many C64 and C128 owners are now or have already upgraded to an Amiga (the recent price cut will make this move even more attractive) and those who do will be wondering what to do with their old C64 printer. Instead of throwing it away, propping up a wobbly table or giving it away to a friend why not invest in a printlink and use it with your Amiga.

This handy device also adds a 64K print buffer which speeds up the Amiga's notorious sluggish printing speed.

Access 64/Precision/£52.10 (excluding VAT).

This similar device justifies its higher price by allowing upgrading Amiga/C64 owners to also use their 1541 and 1571 disk drives with their new machine and also includes a utility to upload precious sequential files into Amiga format and so ease the strain of upgrading.

Touchline:

Datel Electronics, Fenton Industrial Estate, Govan Road, Fenton, Stoke-on-Trent. Tel: 0782 744707.

Microtext, 7 Birdlip Close, Horndean, Hants PO8 9PW. Tel: 0705 595694.

Trilogic, Unit 1, 253B New Works Road, Low Moor, Bradford BD12 0QP. Tel: 0274 691115.

F.S.S.L. (Financial Systems Software Ltd), 18 High Street, Pershore, Worcs., WR10 1BG. Tel: 0386 553153.

A.M.S., 166-170 Wilderspool Causeway, Warrington WA4 6QA. Tel: 0925 413501.

Precision Software, 6, Park Terrace, Worcester Park, Surrey KT4 7JZ. Tel: 01-330 2089.

Suncom (Microprose), 2 Market Place, Tetbury, Gloucs GL8 8DA. Tel: 0666 54326.

Hi-Res Fill

A better way to fill those awkward spaces

By Colin George Wilson

Over the past few months, I have seen various programs appear in magazines which give a lot of help to programmers where graphics are concerned. I have seen programs which plot, unplot and flip points, some which draw lines and circles and others that can even move areas of the screen around. But I haven't seen one capable of filling areas of the screen – intelligently.

There have been spray brush routines, but these take no heed of anything already drawn. What would be useful is a routine which would stop painting when it reaches a point already plotted on the screen.

Certain professional packages such as the designer's pencil already have this facility.

Most of these packages still leave unfilled areas which are in the shadow of some object already present. See figure 1 as an example.

In most fill routines, the computer searches left to right on each line until it meets either the screen edge or a

point already present and then draws a line between them. However these routines often fail to recognise corners of odd shapes.

The simple solution would be to re-fill these areas after the main fill has been executed, but another way is to have the computer check for such areas and then, once it has filled the area as it sees it, go back and fill the remainder.

I have written a program to solve this problem. Originally the program was developed using Basic Lightning. (I understand that Laser Basic has a very efficient fill routine built in, but as I bought Basic Lightning before it was replaced by Laser Basic, I stuck with what I had.) The listing is fairly straightforward and could easily be converted to other graphic languages, but as it is in Basic, it runs very slowly.

The second program, a stand alone version of the first, is written in machine code and resides in the 4K above the Basic ROM, and the table below supplies entry positions for both

Basic and machine code programmers. The source listing has been included for those of you who wish to modify the program for your own uses.

Next, let me explain how the fill routine works. Most people (judging by the amount of hi-res graphic aid listings there are) roughly know the principles of plotting points so I will deal specifically with the fill routine.

First, a buffer area is reserved for the computer to store the co-ordinates of any areas it will need to return to. In Basic, this is matrix ED (number of areas, 1). In machine code, it is a 1K buffer capable of storing 255 sets of co-ordinates.

The key lines in the Basic Lightning listing are explained here.

10010 A buffer pointer is set to zero. This counts the number of co-ordinates found and acts as an index into the buffer.

10015 Two flags, H1 and H2 are set to TRUE (-1). The purpose of these

Figure 1.

STARTING POINT

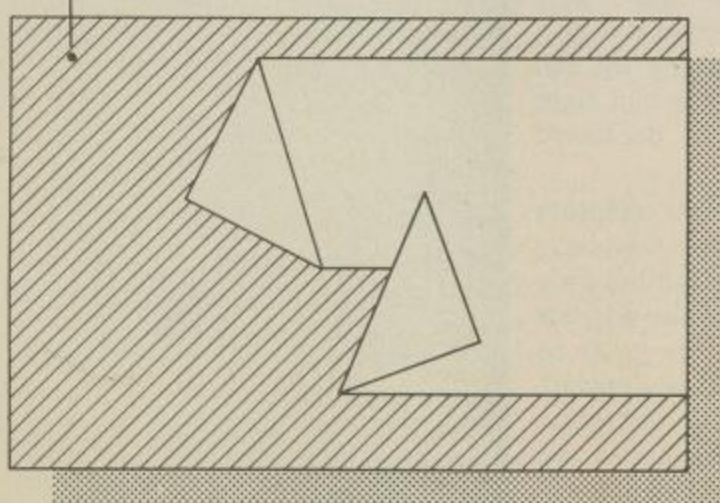
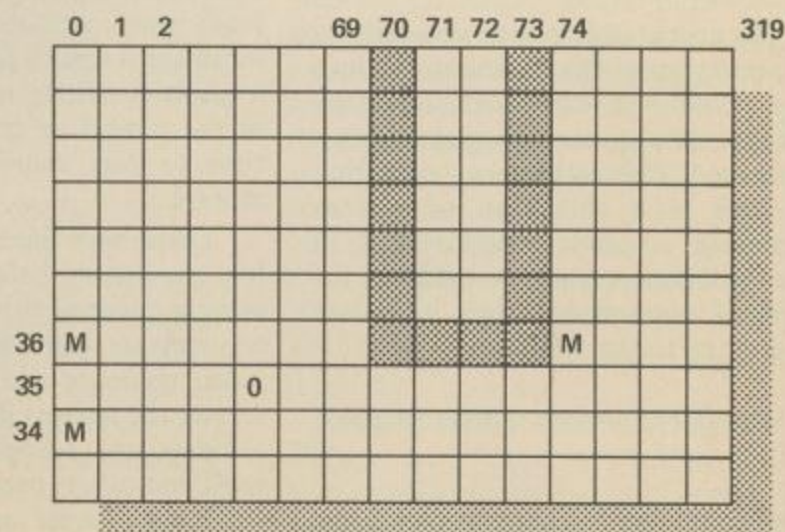


Figure 2.



flags is explained in detail later on.

10050 The computer now searches to the left of the start co-ordinates until it finds the screen edge or a previously set point.

10090 It now performs an identical search to the right of its new found co-ordinates for similar conditions. This time, for every point found blank, it is filled. A subroutine is also called to check for blank areas both above and below the plotted point.

10130 If the buffer pointer indicates that there are no further areas to be filled, the routine finishes.

10140 If not, the last set of co-ordinates stored are retrieved, and the buffer pointer is reduced accordingly.

10150 This continues until either the buffer pointer registers an empty buffer, or the co-ordinates retrieved indicate that the area is still blank.

10160 If the area has been found blank then the fill routine is re-initiated with the new co-ordinates in mind.

10170 Now that everything has been filled, the routine is TERMINATED.

The heart of the program lies in the search routine. This is called every time that a point is plotted on the screen by the fill routine. It works in the following way:

Two flags, H1 and H2 have two states; TRUE (-1) or FALSE (0), and are used to note exactly what is being searched for above (H1) or below (H2) the plotted point.

If the flag is TRUE, then the computer is looking for an empty point. When it finds one, its co-ordinates are placed in the buffer, and the buffer pointer is incremented. The state of the flag is now flipped, and it becomes FALSE. This state now informs the routine that an area has been found, and that a possible dividing line between another such area is being sought i.e. a 'set' point. This prevents the routine from memorising 319 dots where one or two would be sufficient. It is probably BETTER understood with the aid of figure 2.

The points set in column 70 and 73 and row 36 indicate where the bottom line of a rectangle lies. The

circle indicates the start position of the fill routine, and the 'm' signals the points that will be memorised by the computer.

First, a search is made to the left for either a point or the edge of the screen. The latter is found first, so the computer starts drawing a line from 0,35. Both flags H1 and H2 have been set to TRUE to look for and 'unset' points.

They both find one immediately, so the co-ordinates 0,36 and 0,34 are noted. H1 and H2 now become FALSE as an area has been found.

Because these flags are now FALSE, the computer continues its search, this time for a 'set' point.

The first to find one is H1 at 70,36. This simply causes the computer to turn H1 back to TRUE to look for a nutter blank point. The co-ordinates 70,36 are then forgotten as they are of no further use.

The plotting and searching continues until 74,35 is reached. Because H1 is now TRUE, The computer notes co-ordinates 74,36 and turns H1 back to false again.

This time, the computer finishes the line without finding any further 'set' points above or below the line. Now it returns to check its buffer, and three co-ordinates are found:

0,34 - below the start of the plotted line

0,36 - above the start of the plotted line

74,36 - to the right of the rectangle

The last set of co-ordinates are taken and tested to see if the area has been filled from another direction. They are

found to be blank, and so the computer recalls the fill routine with these co-ordinates and this line is scanned in an identical way:

10190 If we are hunting for an 'unset' point.

10200 Check the point, if it is 'unset', move the buffer pointer on by 1, memorise the co-ordinates and flip the flag.

10210 Otherwise.

10220 Check if the point is set so that we can flip the flag the other way.

10240 - 10280 Repeat the above procedure with the H2 flag, scanning below the plotted point.

NOTE: Basic Lightning uses the TOP LEFT as its origin (0,0) but the machine code version uses the BOTTOM LEFT.

The memory for the machine code version is allocated as follows:

\$C000 - \$C358 M/C routines
\$C359 - \$C7FF Free
\$C800 - \$CBFF Buffer area
\$CC00 - \$CFFF Hi-res colour screen
\$E000 - \$FFFF Hi-res bit mapped screen

The routines HIRES and LORES move the screen and switch video banks so that Basic loses no memory at all. Locations \$C359-\$C7FF are available for other machine code routines. The ones I have supplied are as follows:

HIRES	SYS 49152	Switch hires screen on
LORES	SYS 49184	Switch hires screen off
CLG	SYS 49216	Clear the hires screen
PLOT	SYS 49470,X,Y	Plot point X,Y
UNPLOT	SYS 49480,X,Y	unplot point X,Y
INVERT	SYS 49490,X,Y	eor point X,Y
FILL	SYS 49865,X,Y	fill hires screen from X,Y
COLOUR	SYS 49991,A	set hires colour to a (0-255)
POINT	SYS 50002,X,Y	read point X,Y - peek (780) returns 0 if no point set, 0 if there is.

Getting it all in

The Basic program 'Lightning Fill' is provided for those of you with Oasis Software's Basic Lightning program.

'Hi-res Fill' is the basic loader for the stand-alone machine code version. See listings on page 61

This utility program allows the joystick to be used to control the cursor. It can also be modified so that the joystick emulates any other keys, which can be very useful for adding joystick control to BASIC programs. The four files associated with this program are:

JOYCURS	A BASIC loader
JOYCURS.OBJ	The machine code object file loaded by the above
JOYCURS.SRC	A source code file (loads as a BASIC program) for ASSEMBLER/MONITOR 64
JOYMOD	A BASIC program which modifies the routine

The routine is interrupt controlled. It is loaded into the tape buffer where it occupies 128 bytes, \$033C-\$03BB (828-955). To load the utility, load and run JOYCURS. The cursor can now be moved around the screen using a joystick in port 2. Pressing FIRE and a direction emulates the following keys: FIRE/UP = Return, FIRE/DOWN = Space, FIRE/LEFT = Delete, FIRE/Right = Insert

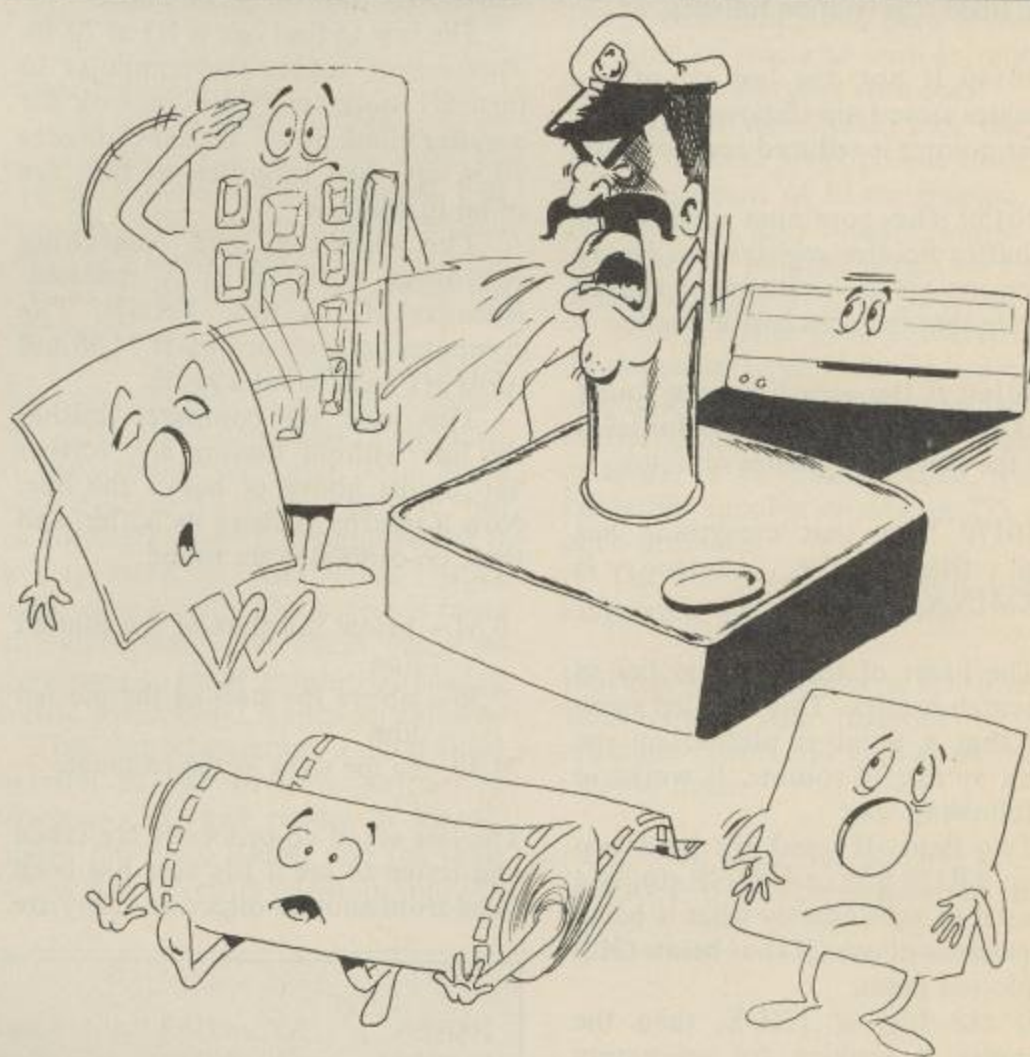
The auto-repeat can be turned on and off by poking location 922. Poking with 0 turns repeat off, with 1 turns it on.

The default settings are very useful for editing programs, but can be changed by loading and running JOYMOD. The program here will load the machine code file and will run through the joystick directions, with and without fire, asking for each one which key that particular action is to modify. If no key is to be emulated, press ←. The program also modifies the default value of the repeat flag. It is then possible to save the modified routine from inside the program so that it can be booted from the users own programs.

(For the technically minded, the program modifies a reference table starting at 923 which contains all 32 possible combinations of the five joystick bits in sequence - many of which are impossible to achieve with a joystick. The table contains the CBM-ASCII values of the keys to be emulated, with 0 representing no key.)

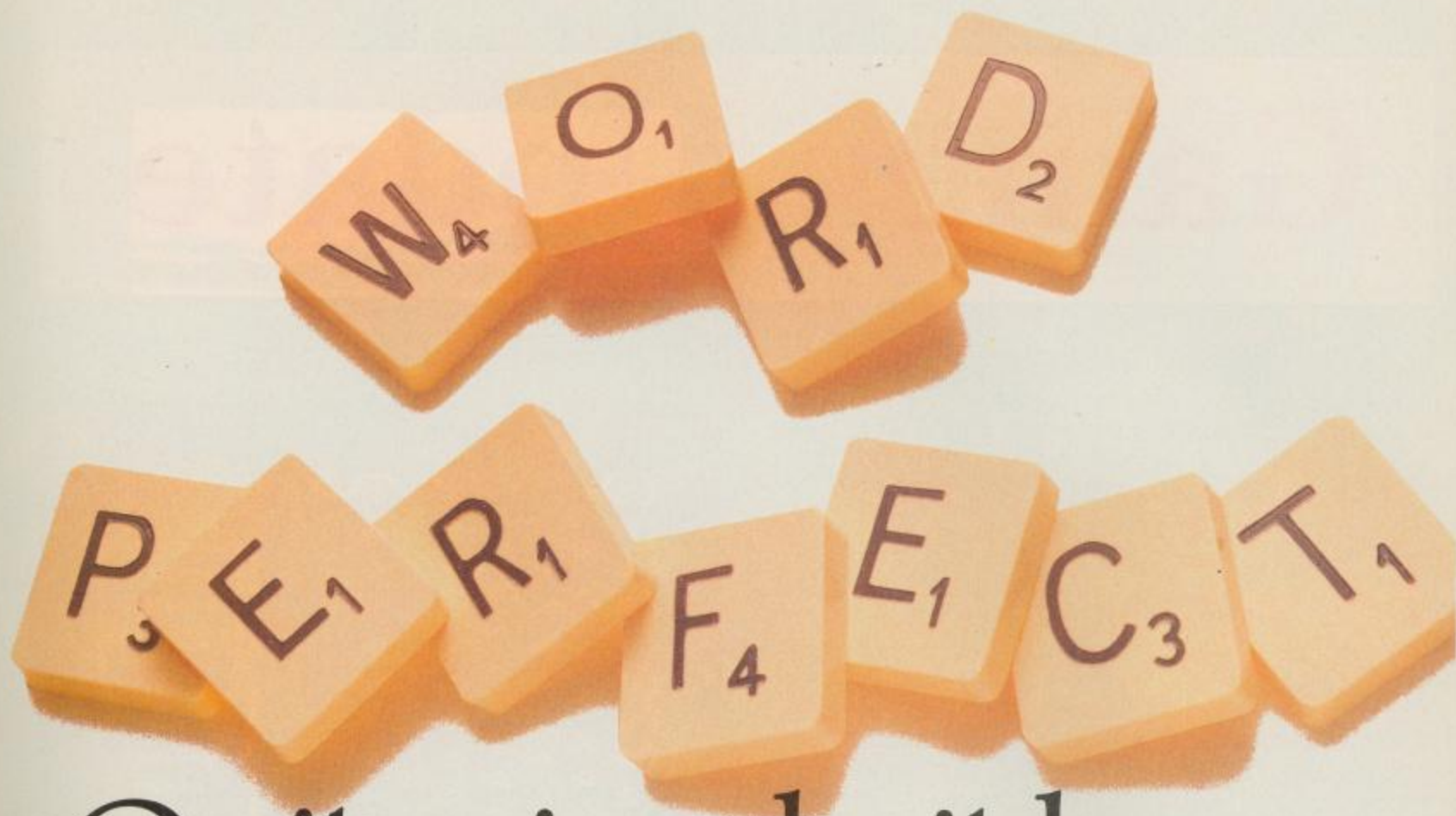
See listings on page 61

Joystick Cursor



A chance to control the cursor and other keys with the joystick with some handy results

By James Kew



Quite simply, it leaves other word processors lost for words.

WordPerfect 4.1 for the Amiga includes many features not found in other word processors.

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Games Update

Alot of budget releases available this month - handy if you're short of the old pennies this month

Yet another quiet month with only a few full price releases as the software companies hold back their major titles for the main autumn offensive. There is however, a plethora of budget games available for anybody looking for the odd pocket money game although it must be said, that a lot of these titles are previously released full price games.

Full Price Titles

Anybody looking for a bargain could do a lot worse than investigate *Chart Busters* from Beau-Jolly. It seems that even compilations are getting bigger and better as this one offers no less than twenty titles. Most of the games were originally released at a budget price and those that weren't are now showing their age somewhat but nevertheless, there are some nuggets of gold among the also rans.

The titles include *Dan Dare*, *Tau Ceti*, *Rasputin*, *Park Patrol*, *Thrust*, *Eyeball*, *Way of the Exploding Fist*, *Ghostbusters*, *Olli and Lissa* and *Brian Jacks Superstar Challenge*. My personal favourite though is *Zolyx*, a fast thinking strategy game that shows that great graphics aren't necessary for a game to be addictive. On a score of 1 to 100 for presentation, *Zolyx* comes in at minus five!

If you are looking for something a bit more challenging on the strategy front, then there is the latest release from the Australian wargame company SSG, marketed by Electronic Arts. *Decisive Battles of the American Civil War Volume II* (disk only) lets you recreate five battles including the decisive Gettysburg and Chickamauga. These two, if handled differently could have turned the whole outcome of the War so here is your chance to prove that you are a better general than Robert E. Lee. As is usual with SSG games, the presentation is superb and a complete construction set allows you to design whatever variants you choose.

Apart from *Netherworld* (see elsewhere in this issue) Hewson has also released *Marauder*. As with all their releases, presentation is first class but the game itself, a vertically scrolling shoot 'em-up has been seen a thousand times before and offers little that is new.

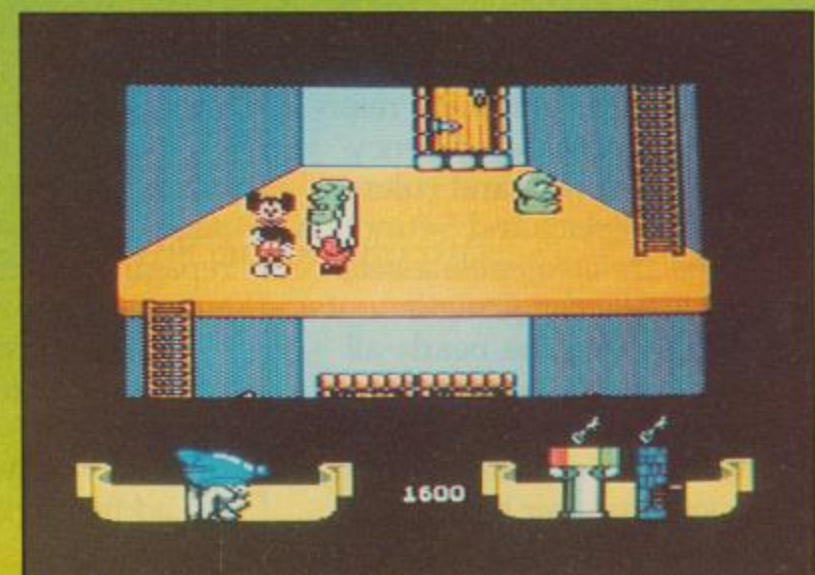
From Gremlin comes *Mickey Mouse* in a game that I didn't really enjoy but which might appeal more to younger players. Mickey has to climb four towers with the ultimate aim of defeating the ogre king. *En route* he must nail shut all the side doors which involves playing four sub-games. There are ghosts and skeletons to be battled using either



Decisive Battles of the American Civil War



Marauder



Mickey Mouse



Road Blasters

the magic water pistol or rubber mallet but I reckon that anyone playing the game will get more nightmares from listening to an appalling rendition of Paul Dukas' *Sorcerer's Apprentice* – the bit of the film *Fantasia* starring Mickey.

Also from Gremlin comes *Blood Brothers*, an arcade adventure for one or two players involving a chase through some mines in search of the Scorpions, a group of space convicts. Although it looks attractive, the gameplay itself left me cold and I just did not enjoy this one at all.

A racing game where you have to blast everything in sight sounds like a good idea but *Road Blasters* from US Gold is yet another game that doesn't quite work. You have to get from A to B within the time limit while at the same time wiping out anything that gets in your way – cars, bikes, mines and gun turrets to name but a few. You can get extra weapons delivered to you from an overhead spaceship if your shooting skills warrant them. Graphics are poor and the scrolling is non too hot either, making control of your car somewhat difficult.

Budget Games

Firebird are the major contributors to this month's budget choice. European five-a-side is actually one of the more playable football games around. In other words, it is possible to take the ball from an opposing player. Nor are you faced with a superhuman computer controlled goalie who manages to stop everything that you kick at him.

There are problems though. Your men have a habit of all rushing up field and staying there so when the time comes to defend, there is no-one there to do it. There is also the habitual problem of control being given to the player that you don't want. The most serious fault though is that it is possible to reach a stalemate position. I became trapped between a defender and the goalie with the ball bouncing out to the corner flag and the goalie diving to save the rebound. The choices were to wait for eight minutes until the game finished, or pull the plug...

Beach Buggy Simulator sees you competing in the dune trials and what trials they are. Apart from having to jump over rocks and other hazards, there is also the slightly more serious problem of passing helicopters trying to blow you to bits. The organisers do however do you the courtesy of fitting your buggy with a gun offering some small crumb of comfort. All this is against a strict time limit with the added problem of diminishing fuel supplies.

I thought that every possible variation of title containing

the word '*Ninja*' had been used up, but no, for there on the desk in front of me is *Ninja Scooter Simulator*. Apart from appearing in the title, the word '*Ninja*' has no connection with the game whatsoever but there again, I don't suppose that an ordinary scooter simulator has vast amounts of appeal. In practice, the game is a variant of a well worn theme. Race along a track within a time limit, leaping over ramps, avoiding obstacles and doing mid air tricks if you feel so inclined.

Racing seems to be this month's main theme. *American Road Race* is an old (1985) Activision game. Choose your opponents and course and head off as quickly as you can avoiding anything that gets in your way. Frequent gear changes are required and you will need to watch your fuel gauge if you are to cross the line first. There are no cars coming towards you to worry about, the only real hazard being when the screen turns black at night time!



Stunt Bike Simulator

My opinion of stuntmen is that they must have an IQ almost as low as Leeds United supporters or magazine editors. Anyone who wants to do that for a living has got to be crazy. Nevertheless, it seems that there are plenty of crazy people about, and at the moment there is no law against stupidity. *Stunt Bike Simulator* (that seems to be Firebird's favourite word this month) lets you dodge obstacles as you attempt to catch men leaping off hang gliders, jump through rings of fire and try to catch hold of passing helicopters.

The theme of shoot 'em-ups whereby as you improve, so you collect bigger and better weapons has been done to death over the past year. So what have Firebird done to add a spark of originality in *Trojan Warrior*? They have got rid of the ubiquitous spaceship and in its place, substituted a man on a winged horse! And what is the object of your quest? Yes, it's yet another princess that has managed to get herself captured! Don't call us, we'll call you.

The final release on the Silverbird label is *Slimeys's Mine* retailing at £2.99 (all the others are £1.99). Hopping from asteroid to asteroid, you must find the entrances to the mines which in turn need to be explored in order to find and assemble bits of a spaceship. Once inside the mine, a screen can only be left when you have shot sufficient aliens to find a red diamond. There are assorted bubbles and boulders to be avoided and maps and banana bombs to be acquired. A decided novelty this month, an original idea!



Trojan Warrior

From Codemasters comes *Poltergeist*, a thirty-two level shoot 'em-up on the lines of *Trojan Warrior* above but without the originality. It is however a lot faster, more complex and better designed than its rival and represents much better value for money.

One of the most interesting budget games is *Rogue* from Mastertronic. It is a sort of one player role playing game-dungeons to be explored, treasure to be found and monsters to be bashed. The map of your surroundings is quickly drawn, all you do is use the pointer to indicate where you want to go. The pointer is also used to manipulate any objects that you find so that you can wear armour, wield (sic) a weapon, eat food etc. You have a number of hit points determining how much damage you can sustain, but you must also watch your ever decreasing strength which needs food or magic to replenish it.

The game doesn't quite work in so much as it is too easy to get killed early on. One of the problems is that combat depletes your strength rapidly as well as your hits and the game tends to be over before you know it. Should you manage to survive the early stages - the use of magic items is necessary, you can save your current character to live and fight another day.



Slimey's Mine

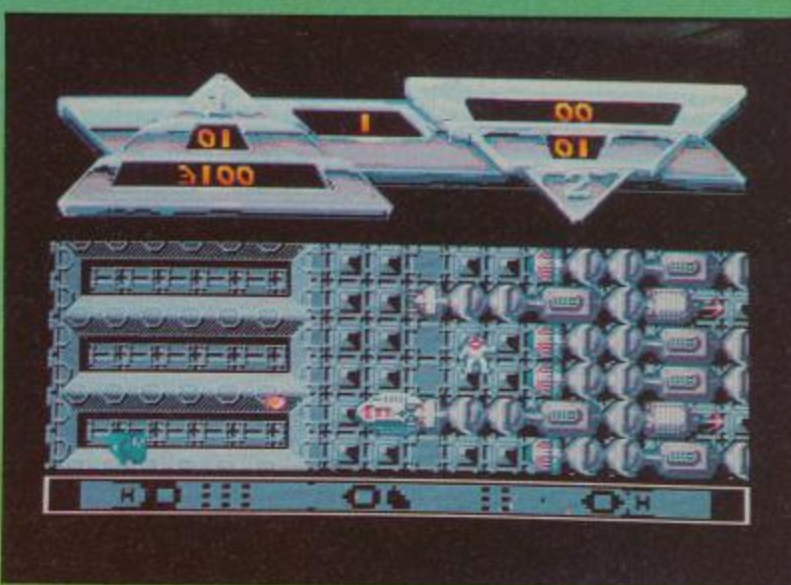
Amiga Games

Things are also quiet on the Amiga front this month with no games that really make you sit up and take notice. Pick of the crop is undoubtedly *Bards Tale II* from Electronic

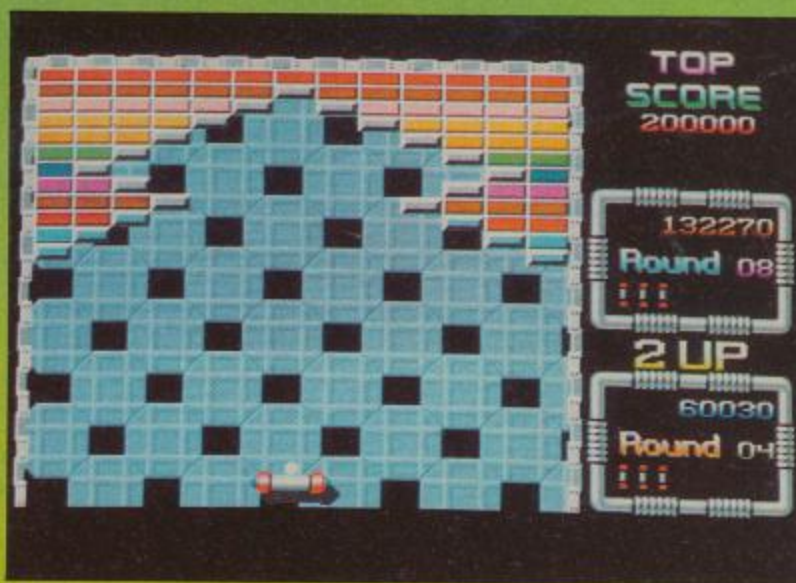
Arts, an excellent although difficult role playing game. There are spells and monsters galore as you battle your way through dungeons and wilderness searching for the seven parts of the destiny wand.

Peter Beardsley's International Soccer is released at an unfortunate time; coming shortly after England's dire performance in the European Championships. The game is almost as lack-lustre. The animation of the players is jerky, the computer opponent too difficult and all too frequently, the wrong player put under your control. The added features of throw ins and corners add little to the game. Best stick to playing against a friend.

Still on the sporting theme, *World Tour Golf* from Electronic Arts. Not quite as playable as *Leaderboard*, it nevertheless offers a real challenge. Don't do as I did and choose the Nasty Nine for your first course when you don't really know what you are doing. Eighty-two over par for nine holes is not a score to brag about!



Return to Genesis



Giganoid

Return to Genesis from Firebird is a shoot 'em-up involving the rescue of a load of scientists. Guess what? Some of the scientists can give your ship extra weapon systems. Now where have I heard that before?

Finally this month comes *Giganoid* from Swiss Computer Arts, an almost exact copy of *Arkanoid*. Sure, the shapes of the screens have been changed but the falling capsules are identical, even down to the letters on them. Why does 'P' represent a bonus life? Take my advice and stick to the original.

VC

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► BASIC 8

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► 1541/71 Disk Drive Alignment Package

Problems with your disk drive? The alignment package reports the alignment condition of the disk drive as you perform adjustments. On screen help is available while the program is running. Includes features for seed and head stop adjustment. Allows you to test each full and half track as you realign the drive. Complete instruction manual on aligning both 1571 and 1541 drives. Even includes instructions on how to load the alignment program when nothing else will load. Works on the C64, SX64 and 128 in 64 or 128 mode. **Only £24.95.**

► 1571 FIX ROM

Are you experiencing any of these problems with your 1571 disk drive, Errors when using Superbase? Device Not Present Errors? Major problems when 2 or more open files? Takes forever to recognize a floppy disk? If you have one or more of these problems then you need 1571 FIX ROM, developed by Commodore Inc USA, just plugs in, solves over 19 main problems. **Only £24.95.**

► Commodore 1581 Disk Drive

The New Commodore 1581 drive is now available for the C128 or C64. This drive offers one megabyte of memory, THREE THOUSAND ONE HUNDRED AND SIXTY blocks free, (800K formatted capacity), and a very fast EIGHT

continued

► The Big Blue Reader

New from SOGWAP Software Inc., The Big Blue Reader is ideal for those who use IBM PC compatible computers at work and have the Commodore 128 or 64 at home. The Big Blue Reader is not an MS-DOS emulator, but rather a unique and easy way to transfer word processing, text and ASCII files between two totally different formats, Commodore and MS-DOS. The Big Blue Reader requires a 1571 on both the Commodore 128 and 64 and will not work with a 1541 or similar drive. **Only £34.95.**

► The Drive Box

The drive box allows you to easily change the device number (8, 9, 10, or 11) of your 1541, 1571, 1570 or 128D computer. It will, as a bonus, allow you to bypass the write protect sensor, allowing you to write to the back side of the disk without cutting a notch. Installation requires a little soldering. **Only £19.95.**

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Bring the power of personal publishing to your C128. Integrate text and graphics to construct everything from high quality newsletters to professional business forms and presentations. Layout and design is quick and straight forward import text created with your word processor. Wrap it around graphics created with Page Illustrator, then change the look by using a different font or repositioning graphics. **Only £49.95**

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THOUSAND Characters per second loading rate. Software for this new drive includes, VizaWrite Classic, HackPack, Petspeed, Oxford Pascal, CAD PAK, Chart Pack, Fontmaster, Spellmaster and much more. Using a package called Super 81 Utilities most software can simply be copied across to the new format. The drive is available for **£184.95.**

► The CP/M Kit & Users Guide

The CP/M Kit introduces and explains the unknown, third mode of the C128. The CP/M Users Guide is a 300 page book by Abacus Software covering all aspects of CP/M. Subjects which include the system disk, resident commands and disk copying are described in detail. The CP/M kit contains over 20 CP/M programs including a word processor, chess game and a disk cataloguing program accompanied by a detailed guide to running programs in CP/M. The CP/M kit and Users Guide. **Only £34.95.**

► Super Disk Utilities

The ultimate utilities disk for the 1571 disk drive and C128 computer. Copy whole disks with 1 or 2 drives, change disk format, perform CBM DOS, CP/M and MS-DOS utility functions, scratch, unscratch, lock and unlock files, write protect disk, contains disk editor, drive monitor, unique RAM writer and more. **Only £24.95.**

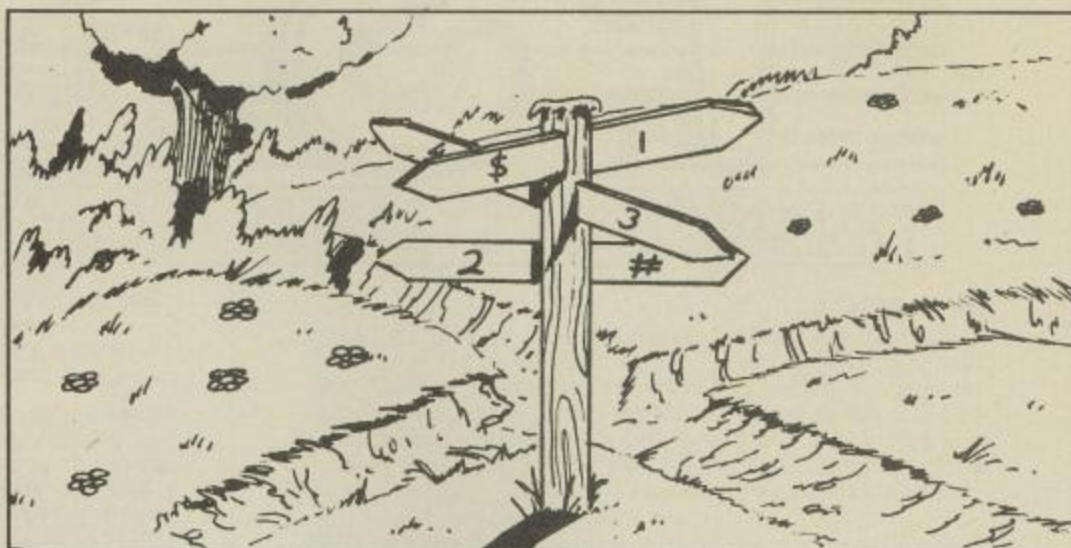
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Code Relocation



Post process a program and turn it into code that, with a bit of run time processing, can be relocated in any part of memory

By Dave Garside

The area of RAM between \$C000 and \$D000 has always been a popular area for machine code programmers. The lack of interference from BASIC and the operating system makes this area ideal for small utility programs. Consequently almost all utility programs published are written to run in this area.

Now while this is no problem when each utility is used in isolation, it would often be nice to combine some utilities into a tool set. The problem then becomes one of space and memory conflict. Because the chances are that the particular routines you would like to combine occupy the same area of store.

Of course there would be no problem at all if the offending code could be relocated to a different part of memory: after all there is plenty of space available. However 6502 code is hardly ever relocatable. The reason being that because of the nature of the instruction set, it is extremely difficult to write relocatable code for anything but the simplest of programs. However it is possible to post process a program and turn it into a code that, with a bit of run time processing, can be relocated to run in any part of memory. The utility presented here provides the tools to perform that processing.

How It Works

The easiest way to explain how the relocater works is through a simple example. Consider the following piece of source code:

```

bl      ldx # 0
        lda store,x
        beq fl
        jsr charout
        inx
        bne bl
fl      rts

```

store txt "this is a very trivial example"
by 0
charout=\$ffd2

Assembled to memory locations \$c000 and \$4c00 the above routine would appear as follows in a disassembly:

c000	a2	00	ldx	# 0
c002	bd	0e c0	lda	\$c00e,x
c005	f0	06	beq	\$c00d
c007	20	d2 ff	jsr	\$ffd2
c00a	e8		inx	
c00b	d0	f5	bne	\$c002
c00d	60		rts	
c00e	54		byt	\$54
c00f	48		etc	for rest of string
4c00	a2	00	ldx	# 0
4c02	bd	0e 4c	lda	\$4c0e,x
4c05	f0	06	beq	\$4c0d
4c07	20	d2 ff	jsr	\$ffd2
4c0a	e8		inx	
4c0b	d0	f5	bne	\$4c02
4c0d	60		rts	
4c0e	54		byt	\$54
4c0f	48		etc	



If we consider the binary representation of the two pieces of code it can be seen that the only bytes that are different are those containing the high byte of the start address for the text string 'store'; the relative branches will have the same offset values, the address for charout is the same in both cases and the low byte of the start address for store is the same because both routines are assembled to start at a page boundary.

This establishes the first principle on which the relocator is built - when a program is assembled to two different parts of store, each starting at a page boundary, the only bytes that will differ are the high bytes of addresses that vary with the program start address. And these bytes can be identified by comparing two such assemblies.

The relocator does just that, but on finding a difference it replaces the byte with a marker value and stores the offset value (actual value-start address) in a table appended to the end of the program. Before it can do the comparison the relocator has to decide the marker value, which must be a value that does not appear in the program being processed. It does so by doing an iterative search on the first assembly until it finds an unused byte. This might seem to constrain the use of the utility, but in practice programs that use all 256 possible values are rare unless they contain lots of graphics.

Once the program has been processed the utility appends a file containing the user end of the relocator to the beginning of the market

program, and then saves out the whole package as one complete file. The overall memory requirement for producing a relocatable version of a 4K utility is shown in Figure 1.

From Figure 1 the following constraints can be deduced:

- (1) The lowest point in memory for the first (processed) assembly is \$0800 plus the length of the boot file which is fixed at \$0200 bytes.
- (2) The second assembly must start above the first, although it is not necessary to allow space for the relocation data as the second assembly is only processed once and it does not matter if it is overwritten by the data table.
- (3) The end of assembly 2 must fall below \$A000.

This gives a limit to the size of a relocatable program of \$9400/2 bytes i.e. approx 18K, which is more than enough for most utility programs.

The relocating boot file simply does the reverse of the relocating processing: it prompts for the new start address and scans the program from start to finish for the marker bytes. If it finds a marker, it looks up the relevant offset in the relocation data, adds the high byte of the new address and pokes the result back into the program.

When all the markers have been processed the program is booted to the start address and the user is prompted as to whether the program is to be executed. If the answer to the prompt is positive, control is passed to the first instruction of the program. Note that this is the final constraint on using this utility; the first instruction of the program must either be the run address or a jump to the real run address. If the user does not want to run the program immediately, control is returned to the interpreter and the start address is displayed in decimal.

Using the Utility

There are really two sets of user instructions, one set for the programmers producing relocatable programs with this tool, the other set for the end users.

The user - using a relocatable program is simplicity itself. The program formed by the relocator is a machine code program with a BASIC front end, so the program is loaded and run as you would a BASIC

program. From then on all the required information is given on the screen.

The user is supplied with the length of the program and asked to provide the new start address, which is done by over-typing the default address of \$C000 and pressing return (note that the start address given must be such that the boot program is not overwritten, i.e. the area \$0800-\$0A00 must not be used). The program is relocated to that address and the user is then asked to indicate whether the program is to be started straight away. A negative response results in the start address being supplied as a decimal figure, an affirmative reply activates the program.

The Programmer - to produce a relocatable version of a program follow these steps:

- Load and relocate the utility as described above, but do not run the program.
 - Assemble two versions of the program to be processed according to the constraints identified above.
 - Now run the relocator by SYSing the start address.
 - From this point follow the instructions given by the program.
- NB** There is only limited error checking provided by the program, so ensure that disk drives, etc are connected and switched on, and there is sufficient room on the disk/tape to receive the finished program.

Finally by way of an example of the increased flexibility given by relocatable programs, I've included (listing 2) a version of the public domain program 'Supermon 64'. This version will relocate to anywhere in normal RAM so is really useful when developing machine code programs because you can squeeze it into any available 2K slot.

Both the Relocator and Supermon are supplied as BASIC loaders and the following procedure should be observed:

- Type in the listing.
- Save before running.
- Run the program which will convert the BASIC data back to machine code.
- At the prompt, give a filename, and at the following prompt specify tape of disk.
- The program will be automatically saved and can then be tested.

See listings on page 61

Figure 1

	-\$A000
	-\$3000
assembly 2	
	\$2000
relocation data	
	\$1A00
assembly 1	
	-\$0A00
relocating boot file	
	-\$0800
	-\$0000



A Short Interlude

We follow on from last month's explanation of how to use interrupts to carry out several tasks at once

By Michael Tinker

The routine presented this month is much more sophisticated and a lot easier to use particularly with utility interrupt programs.

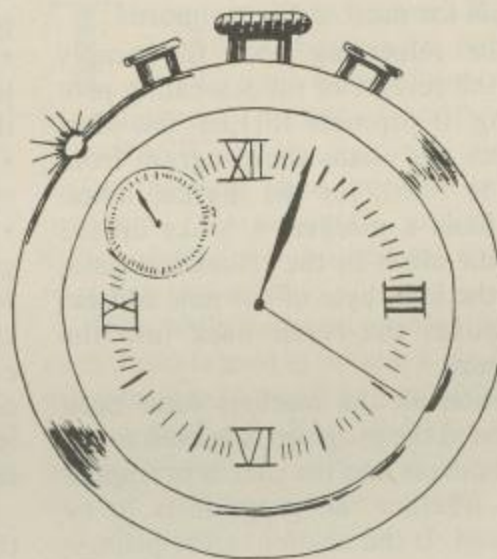
To refresh your memories (no pun intended), last month's program executed up to five interrupt routines stored in a short table. This enabled varying numbers of routines to be used at once.

The main shortcoming with the last program was that it was virtually essential to use a Machine Code monitor to add or remove routines from the table of interrupt routines. Therefore this month I have added a "wedge" into the CHARGET routine to enable the extra facilities to be added.

These facilities are a list command which will list all the interrupt addresses being called, an add command to enable addresses to be added to the table and a remove command to enable easy removal of interrupt routine addresses in the table.

How does it work? First allow me to give a quick explanation of what a wedge is. A wedge is a small routine placed into the operating system of the computer so that when a pre-determined action takes place the wedge will pass control to your own routine.

In this routine I have placed the wedge into the CHARGET routine which is used to get a character from the input buffer when in direct mode or from a BASIC program when one



is running. The wedge routine first checks that the computer is in direct mode then looks to see if the first character is the left arrow symbol. If it is, further checks are made to find out what the command is.

For the commands I have chosen "A" for add, "R" for remove and "S" for table directory. The full commands are as follows:

- left arrow A interrupt #, address (in decimal)
- left arrow R interrupt #
- left arrow

For example: left arrow A2,12288 will add the routine address 12288 into interrupt number two position in the interrupt table and the routine will then be called on every interrupt along

with any further routines in the table.

Notice that the system also stops the interrupts while it inserts the address into the table and restarts them afterwards. This will prevent a complete "lock up" while the address is only partly changed.

One of the features of this improved system is that when using the Mikro Assembler program listing the size of the table can be easily changed. At the top of the listing is the constant called Maxint; this gives the maximum size of the interrupt table.

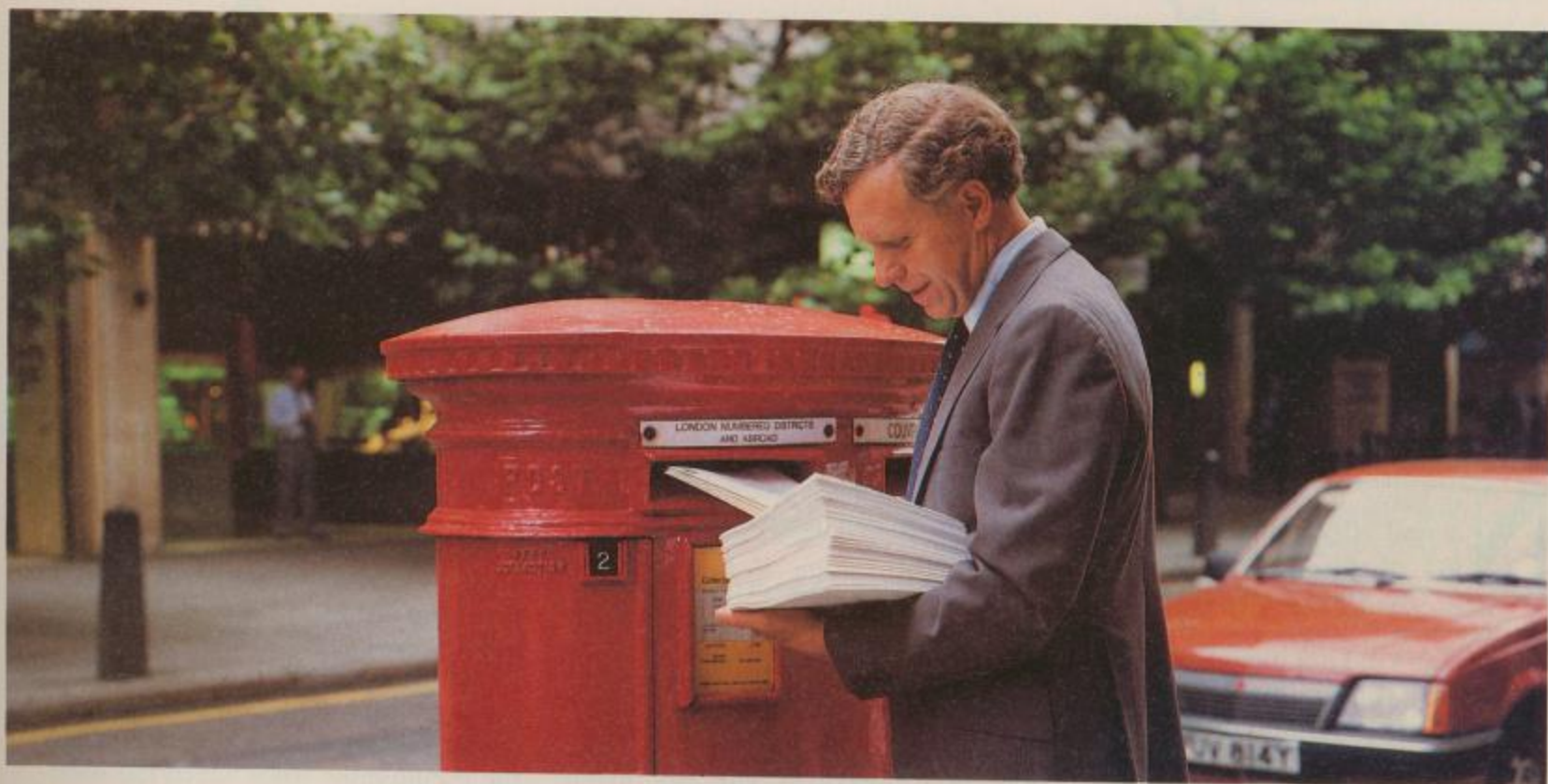
To change the size all that you need to do is to change this one number before assembling the program. The assembler will then place the correct values into the remainder of the program.

The start of the program has also been written so that it will place zeros into all of the table when called. Care must be taken however to ensure that any Machine Code placed after the routine does not get erased by this process. Don't forget the table array uses two bytes for each address so that, for example, an interrupt table five interrupts will take ten bytes of memory.

There are further improvements to be made to this system, such as adding the interrupt commands to BASIC, this however goes beyond the scope of this article but the more enthusiastic among you may wish to try.

See listings on page 61

The day Roger Jackson sent his first mailshot.



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24 YC 10

May I Interrupt

Fine tuning is the key to setting up a continuous music routine.

By Eric Doyle

No game is complete without sound effects and music. The art of programming sound involves the impressive array of registers which forms the SID chip and, though I did not intend to go into depth on this subject, a little understanding of the nature of the chip is essential.

Sound effects are 'spot effects' which means that something occurring on the screen is accompanied by a synchronised sound. This is often better handled outside the interrupt system and music is the usual area of interest for interrupt handling.

A sound has several elements; pitch, loudness and shape. In reality, this is a complex relationship but on the SID chip complexity has to be created. The majority of programmers can never hope to reach the symphonic complexity of Rob Hubbard's work, but impressive sound can be produced with a modicum of knowledge and skillful editing.

Each of the three voices of the SID can span seven octaves and the range is more akin to a violin than a piano. This is because a piano has fixed notes which cannot easily be altered (tuned). Play each successive note on a keyboard and the best result is still a series of steps. A violin can produce the same accepted range of notes which form the western concept of music but, by sliding a finger up and down the strings, a continuous rising or falling sound can be produced which includes frequencies that are not catered for in the accepted concept of scales of equal temperament.

The SID is stepped but only in small increments which can fool the ear into believing that a continuous, rising note is being produced. For

sound effects this is wonderful, but for music a certain degree of editing is necessary.

In machine code programming, a look-up table based on Table 1 is faster than calculating the value of each note's frequency. All frequencies in the range have values greater than 255, or one byte. For this reason each voice has two locations for the pitch frequency - a low byte and high byte store.

Beyond pure pitch a sound has a shape. Sharply press a key on the piano and a sudden noise is produced. It rises to full volume instantly and then dies away gradually, bang a table and the sound appears and disappears almost instantaneously, or draw a bow across a violin string and the note will gradually build up and fade. There are four elements which describe a sound shape to the SID: attack, decay, sustain and release. Together these elements are known as the sound or ADSR envelope.

Attack is the time taken for the sound to reach full volume. Decay, sustain and release are related and describe the way in which the sound dies away. Decay describes how quickly the sounded note falls away immediately after maximum volume is reached, sustain determines the time at which the release phase takes over from the decay and release is how quickly the note disappears. Effectively, decay and release are two parts of the same downward slope separated by the sustain plateau.

For the piano, a short attack phase would be followed by a slow decay and a fast release, the banged table would have a fast attack followed by a fast decay and release, and the violin would have a slower attack followed by a slow

decay and moderately slow release. Most diagrams of the ADSR show sustain as a plateau but this is not always the case. Sustain determines how long the decay lasts before release takes over (Diag 1).

Another aspect of sound shape is the waveform. This can be sawtooth, triangle or pulse, each name describing the oscilloscope trace which the wave produces. Sawtooth and triangle are also very descriptive of the sounds that they produce - sawtooth is a rasping sound and triangle gives a gentler, ringing tone.

Pulse is more variable than the other two and is as near to a pure sine wave that the digital nature of the computer can produce. When using pulse a width has to be specified for the wave which determines the harmonic qualities of the sound.

Getting Down To It

Machine code is far more suited to music programming than Basic. On a keyboard notes are played simultaneously but the computer initiates one note at a time. A chord in Basic takes time to create and often sounds as though the notes were pressed in quick succession. This is similar to what occurs with code but the time delay is so short that the notes sound simultaneous.

The first task in programming is to decide how to store the notes. In the program example, the method used is not the most efficient but it does show the principles to best advantage and gives a basis from which to work.

A note consists of a pitch and a duration. To specify duration on the Commodore, the note length is based on the demi-semiquaver which has a duration of one cycle. This means that

the crotchet has a value of eight cycles. In the code this is directly expressed by the number of repeats of the note in the data. Examine the low byte data for Voice 1 and these repetitions can be seen within the numerical values.

Each note has a high and a low byte so there are two tables relating to each voice.

Voice 1

\$C000 - \$C148 High frequency
\$C150 - \$C298 Low frequency

Voice 2

\$C400 - \$C548 High frequency
\$C550 - \$C698 Low frequency

Voice 3

\$C800 - \$C948 High frequency
\$C950 - \$CA98 Low frequency

The spaces between the tables pairs are occupied by waveform values.

\$C2A0 - \$C3E8 Voice 1
\$C6A0 - \$C7E8 Voice 2
\$CAA0 - \$CBE8 Voice 3

The ADSR values and volume are constant throughout so the core routine starts with these at line 310 of the assembly code. Most of the waveforms used by these ADSR values are triangular but Voice 2 uses a pulse occasionally and must have a pulse width set. This is also created at the beginning of the core at lines 450 to 480.

These values are constant and may be set outside the routine as long as any program running with the music does not access the relevant locations. Ideally the routine should store all of the SID values at the commencement of the interrupt, set the music parameters and replace them original values on leaving.

Setting the sound frequencies and waveforms is done by a self-modifying program which increments the load location where the notes are found. Lines 490 to 660 relate to the fetch and poke locations for the pitch

parameters and lines 790 to 960 increment the relevant locations within this routine ready for the next interrupt.

The interrupt must be able to repeat at the end of the tune. This means resetting all of the parameters for fetch commands. To do this, lines 670 to 720 test the high byte values for Voice 1 to see if location \$C298 has been reached. If the test proves true then control is handed to the reset routine at 730 to 780 before returning from the interrupt.

If the routine was now used as an interrupt, the music would rattle through at a high rate of knots. Some form of tempo control is needed.

Lines 250 to 300 cope with timing by aborting four out of five interrupt calls. A flag is set up at location \$CCFF with a value of four. As each interrupt call is made, this flag is reduced by one. When the flag reaches zero it allows a full music interrupt to occur and resets the flag to its original value ready for another countdown.

Lines 1110 onwards sets up the interrupt in the normal way, remembering to include the interrupt enabling structure at 970 - 980.

Musical Chores

The problem with music is that it is rhythmical. This means that timing is crucial and disk or tape access will totally halt the tune but the main enemy is accompanying interrupts.

Chained interrupts can be used alongside the music routine but the effect on the music can be drastic. Interrupts for screen scrolling use long and short routines and care must be

taken to allow for any delaying effects which these may cause. Raster linking can assist by further tying the routines down to reasonable lengths.

The inhibitive length of the music data as presented in the example program would obviously use too much memory for most practical purposes. The contents can be greatly reduced if an indexing system is used.

Set up a table of all the necessary frequency values and use a numbering system such as \$01, \$08, \$11 to indicate the lowest note on the table held for eight sixteenth notes (a crotchet) with a triangular waveform. The frequency values could then be found and poked to the relevant registers at the same time as the waveform. The duration can be stored in a location and decreased each time an interrupt is called until it reaches zero. Then the next value can be called up.

Such a system requires quite a lot of work from the interrupt routine but does increase the flexibility of the program.

The data can be pushed under a ROM, to free even more easily available RAM, if the relevant changes are made to location 1 on entering the interrupt and reset on leaving.

Using the Example

The example program can be tested by poking \$CCC2 (52418) with \$CC (204) and the next location with \$10 (16). Location \$CC8C should then be poked with \$60 (96) and then SYS 52237 will run the tune once.

When all is correct the changed values can be reset and SYS 52480 will run the interrupt. YC

Table 1

Note	Octave							
	0	1	2	3	4	5	6	7
C	010C	0218	0430	0861	10C3	2187	430F	861E
C#	011C	0238	0470	08E1	11C3	2386	470C	8E18
D	012D	025A	04B4	0968	12D1	25A2	4B45	968B
D#	013E	027D	04FB	09F7	13EF	27DF	4FBF	9F7E
E	0151	02A3	0547	0A8F	151F	2A3E	547D	A8FA
F	0166	02CC	0598	0B30	1660	2CC1	5983	B306
F#	017B	02F6	05ED	0BDA	17B5	2F6B	5ED7	BDAC
G	0191	0323	0647	0C8F	191E	323C	6479	C8F3
G#	01A9	0353	06A7	0D4E	1A9C	3539	6A73	D4E6
A	01C3	0386	070C	0E18	1C31	3863	70C7	E18F
A#	01DD	03BB	0777	0EEF	1DDF	3BBE	777C	EEF8
B	01FA	03F4	07E9	0FD2	1FA5	3F4B	7E97	FD2E

The world's most famous football game has a sequel. Football Manager caused me more bleary eyes and sleepless nights than any other game. Now it's all going to start again.

Much of the original game is still there, after all, why change a winning formula. You still manage your favourite team and you begin your reign at the foot of the fourth division. Nine skill levels decide the difficulty of the task that lies ahead and you must use your skill to pick the teams that will win you league and cup glory and buy and sell players to fill your squad and you still have to stand helpless on the sidelines while the matches are played.

The first thing you'll notice when you take over the manager's chair is that the players have changed. They



Football Manager II

are still rated for skill and fitness but the Peter Withes, Gary Shaws and Tony Morleys of the original have been replaced by Gary Lineker, Ian Rush, Mark Hughes and Brian Robson.

The fitness factor is now rated out of 100 and if a player's fitness drops below 50 he's injured and out for at least the next game. The team selection has now become more meaningful as you must select players to fill forward, midfield and defensive positions. Since there are four positions in each (and of course, a goalkeeper) you can't fill them all which gives you scope to change the formation and man to man markings.

You can also assign two substitutes to bring on at half time to fill any gaps exploited in the first half or open up play by bringing on a winger for a defender.

In the original game the outcome of a match was decided in the difference in skill totals for various areas of the field but now the more realistic player vs player match results

in more action and more control over the final result. For example even if the total of your three defenders is greater than the opposing attack; if you leave a skill 3 forward unmarked you're asking for trouble.

The games themselves consist of untimed highlights but instead of just a selection of set moves the players dribble, pass and cross the ball and shoot at a diving keeper. The action is still played at a snail's pace, after all this is no International Soccer but even slow action can get the adrenalin going in a crucial promotion or relegation battle.

In between games you can alter the style of play by having extra passing practice and increase or decrease the height and length of the passes and determine whether your side is going to be short passing team like Liverpool or adopt the hit and hope style of Wimbledon and Watford. There's more to this than the style of play as long high balls from defence can bypass a weak defence and get the ball straight to your forward line.

Football Manager II is a tidier game as the program now tells you which of your players scored the goal including midfielders, money that you receive at the end of the season to bolster your failing bank account that you squandered on a third goalkeeper comes now in the form of shirt advertising deals. The deals that you're offered vary considerably and the number of deals depend on your management rating so if you're doing badly you should take the first deal offered because if you turn it down there might not be another.

A longer 23 match season and two cups (FA and League) to play for will suit Football Manager fans who will wallow in every game but may put off others who prefer less thought and faster action.

T.H.

Touchline:

Title: Football Manager II. **Supplier:** Addictive Games (Prism Leisure), Unit 1, Baird Road, Enfield, Middlesex, EN1 1SJ. **Tel:** 01-804 8100. **Machine:** C64. **Price:** £9.99 (Ca) £14.99 (Disk).

File Extension



Now you can load and run files from a directory in a single key press with this basic utility

By James Kliemt

Normally after listing a directory, loading a file involved moving the cursor to the file name, typing LOAD, cursoring through the file name, typing either ",8,1" or "8", spacing over the three-letter file description and finally pressing RETURN. File Extension permanently writes the load description to the end of any file you nominate. To load a file thereafter, you simply list the directory, cursor up to the file name and push SHIFT & RUN/STOP.

File Extension will work on a Commodore 64 or 128 in 40 or 80 column modes. The program is in Basic, therefore there are no special instructions – just type it in and save it as you would a normal program.

To use File Extension, load it and type RUN. You will be asked to insert a disk and press RETURN. File Extension will then read the directory and print it to the screen. You can stop the directory at any time by pressing SPACE. If it is finished reading the directory or you have pressed SPACE, you will be taken to the main menu. Here you are presented with the current file name displayed in the top left hand corner of the screen and a list of options. Use cursor up and down to view other file names in the directory. Pressing HOME will take you to the first file name in the directory and SHIFT HOME will take you to the last.

Once you have selected the file you wish, press the appropriate key. If you press 1, the computer will add ,8: to the end of the file name – the load description for any basic file. Pressing 2 adds ,8,1 to the file name – for binary or machine language files. Pressing 3 will result in a : being added to the file name. This is for 128 files.

A number of other options exist. Pressing the minus key will erase the current file. The @ key allows you to access disk commands such as validate, new, etc. R lets you rename the current file and P will list the directory to the printer. Any time you wish to view the disk status, simply press S. Once you have completed operations on a disk, press SPACE to return you to the insert disk option.

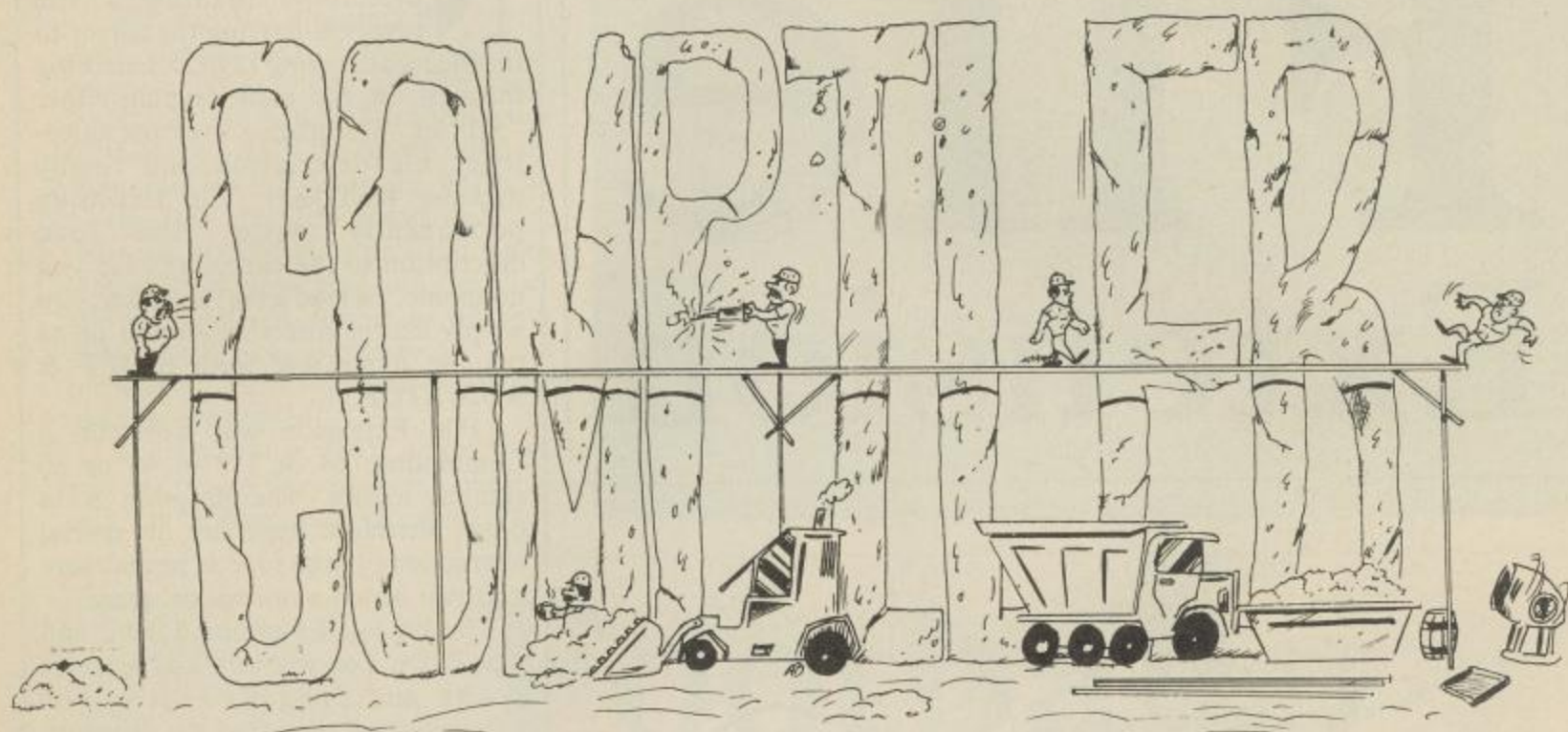
See listings on page 61

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Constructing a



We hope your typing fingers are in good shape as we launch into the next two programs in the FCL compiler series – the code generator and the assembler

By Steve Carrie

Although codegen may look rather complicated, its operation is very simple. It reads the .SFC file created by compile and generates an assembly-language source file .ASM. Codegen is able to recognise the operation codes in the pseudo code file and how many opcode bytes each should have. (These codes were listed last time.) It then uses a library of preset assembly-language lines to make up the output file. Some of these library routines simply make a call to the SYSLIB library, others are several lines long and perform data transfers between the system variables and other memory locations.

Codegen is also responsible for making the program header to allow the final runtime file to be loaded and run as if it were a BASIC file. If you already have a disk-based assembler, you may not need to use the assemble program at all since it is easy enough to change the preset routines in codegen to suit your particular program.

Most of the work done by codegen

is performed in subroutines, the first section of the program simply diverting control as necessary. The first task is to read in the two data files containing symbol and string information (the .SYM and .LTR files). These are entered into tables in a similar format to those in compile. The next task is to open the work files and generate the program header. This header contains the org directive for the assembler and this should be changed if the program is to be loaded at an address other than the default start of BASIC at 2049 (\$0801). Next, the symbol and literal tables are processed. The tables are updated with information regarding the position of variables within the program. Codegen knows how much memory should be allocated to each type of variable and it also generates the literal strings in the correct format. Once this is done, work can then begin on the program itself.

The code is read one line at a time and control is passed to the pseudocode processing subroutine

which in turn passes control to the appropriate routine to generate the assembly source text. As you may recall, some codes require operands and each routine knows how many operands it needs and reads them as required. There are two distinct blocks of routines; those handling pseudocodes 0-33 and those handling codes 128 to 191. The latter set of codes are the keywords.

During code generation, the program keeps track of how many lines are being generated into the .ASM file. The only problem that may arise here is if the disk space becomes scarce, the process will abort.

If, during code generation, a "Not Implemented" message appears, some illegal opcode has been found. This may indicate an error in compile. While on the subject of the opcodes, you will need to add extra lines to codegen if you decide to extend the compiler system with new commands.

The compile program should automatically load and run codegen for you (assuming the compilation was

error-free). When asked for the filename, you should enter exactly the same as you did for compile.

Codegen will report the number of lines being generated as it processes the pseudocode file. Upon completion, codegen will load and run the FCL ASSEMBLE program.

The only possible error is the "not implemented" message which indicates that an opcode was not recognised. This may mean one of two things:

- there is an error in compile, or...
- You have added new commands to compile without adding the necessary handlers to codegen.

The Assembly Stage: ASSEMBLER

Assemble is a very basic two-pass assembler written entirely in machine code and is presented here as a BASIC loader. It must be loaded and run as if it were a BASIC program only at the default BASIC start address of 2049 (\$0801). The reason for writing this program in machine code will be obvious when you run compile, BASIC would be very very slow... In order that the program loads at the correct address, you must ensure that it is constructed at 2049. *Before you start typing in the BASIC loader, execute the following command in direct mode.*

POKE 8192,0:POKE 44,32:NEW

This moves the start of BASIC upwards in memory to 8192 decimal (\$2000 hex). If you are entering the program in stages, make sure that you type this command every time BEFORE you start and make sure you haven't got EDIT installed!

Since I have had considerable assembler-writing experience, I didn't really need to spend time working out the routines required and coded directly into machine code. Actually, the original version of this assembler was written on a PLUS/4, as was the original version of compile, and converted across to the 64.

The next bit is a short user manual for the assembler which is entirely disk-based in its operation; i.e. there is no assemble-to-memory option available.

FCL Assembler User Manual

In the following document, **boldface** characters are used to represent valid

assembler directives only. This program will switch the character set to lowercase mode and it should be noted that uppercase characters are only allowed in literal strings or comment lines.

Getting Started

The program should be loaded as would a normal BASIC program using the LOAD command. If you are using assemble as part of the FCL Compiler System, the codegen program will automatically load and run the program for you.

The program file to be assembled should have extension .ASM by default. The program will request input of the filename; you should only enter the first part of the name e.g. to assemble PROG1.ASM you need only enter PROG1 when asked for the filename. The assembler will produce a file with extension .EXE; e.g. for the above example, PROG1.EXE.

During assembly, information will be printed on the screen relating to the current program state. During PASS 1, no messages other than the pass message will be output unless an error occurs whereupon an error message is printed and assembly aborted. During PASS 2, the program will be listed as it is processed. Again, any errors will cause an error message to be output and the assembler will stop.

On completion of a successful assembly, information relating to the start and end addresses of the program will be printed. The start address of the program is deemed to be the load address. Runtime .EXE files should be loaded using a specially written loader or use secondary address 1 in a BASIC LOAD command; e.g. LOAD "PROG1.EXE",8,1

Directives

There are seven directives valid with this assembler:

- **byt** - assemble a byte value. May also be used to assemble a line of text delimited by single quotes (').
- **wor** - assemble a word value (2 bytes) in 6502 lo-byte, hi-byte order.
- **eqz** - Equate zeropage. Explicitly define a symbol as type 'byte'.
- **eqa** - Equate absolute. Explicitly define a

- **org** - symbol as type 'word'. Set code origin. Sets the assembly address and therefore the load address of the assembled program.
- **res** - Reserve a block of memory. Memory bytes are initialised to zero.
- **(full stop)** Define a symbol. May be followed by an equate or either byte or word type. If no equate follows then the current assembly address is used; i.e. defines a line label rather than a symbol.

Operators

The assembler accepts normal 6502 assembly language notation and addressing modes. The hash (#) denotes an immediate operand and the symbols < and > may be used to define lo-byte or hi-byte operations. A full list of operators is given below.

Operator	Action	Example of Use
<	lobyte	lda #< symbol
>	hibyte	ldx #> symbol
+	add	lda symbol+1
-	subtract	ldx symbol-1

Numeric Types

Only decimal and hexadecimal types are catered for. A hexadecimal number must be prefixed with a dollar or ampersand while a decimal number need no prefix at all. For example:

\$8000 as in lda \$8000 means address 8000 hex (32768)
8000 as in lda 8000 means address 8000 decimal

Error Messages

Error messages may be printed out by the assembler during either pass 1 or pass 2. Errors during pass 1 are normally syntax-type errors where the programmer has misspelt a word or used an illegal character sequence. Errors during pass 2 include those of pass 1 and also symbol-type errors such as relative branch range errors.

These error messages are listed in Fig 1. and are printed in either of two formats. During pass 1, the line in which the error occurred is printed and the error message is displayed below

it. During pass 2, the program is being listed anyway so only the error message is displayed.

Assemble Error Messages

Undefined symbol error – indicates that a symbol has been referenced but has not been defined using the directive (full stop).

Redefined symbol error – indicates that a symbol has been declared twice or more times.

Mnemonic not recognised - the mnemonic found was not a standard 6502 type or assembler directive.

Bad symbol error - means that a symbol was syntactically incorrect.

Illegal Operand field – occurs when an operand is syntactically incorrect.

Illegal Mnemonic field – indicates that a mnemonic was expected but something else was found instead.

Missing operand error – an operand was expected but was not found.

Disk file error – file is missing or possibly the disk is faulty or full.

Syntax error - this is a general message, possibly indicates a bad operator.

Illegal quantity error – indicates that

a numeric literal was out of range, i.e. too big.

Illegal addressing mode - indicates that you have tried to use an instruction in an incorrect addressing mode.

Not X or Y index - only X and Y index registers exist on the 6502. You have specified an incorrect index.

Symbol table full - assembly cannot continue due to lack of symbol workspace.

Branch range error – relative branch instructions have a range of -128 or +127 bytes. You have exceeded these limits.

Example of an assembly language source program.

```

10 ; Example program
20 ;
30 org $c000
40 .border eqa $d020
50 .screen eqa border+1
60 ;
70 .start ldx # 0
80 stx border
90 stx screen
100 inc border
110 .loop1 inc screen

```

```

120 lda screen
130 cmp # $0f
140 bne loop1
150 inc border
160 stx screen
170 lda border
180 cmp # 15
190 bne loop1
200 .exit
210 rts

```

Note the use of the symbol declaration directive (full stop) and the combination of symbol label and instruction in line 110. Lines 200-210 show how you may place these on separate lines. Remember that the org directive not only sets the code origin, it also sets the file load address on the disk. This is important because the address defaults to \$0000. Loading a file at this address will almost certainly crash the machine!

So now you have EDIT, COMPILE, CODEGEN and ASSEMBLE. Next time I will present the final part of the system, the SYSLIB runtime library and some example programs will also be included.

See listings on page 61

Y6

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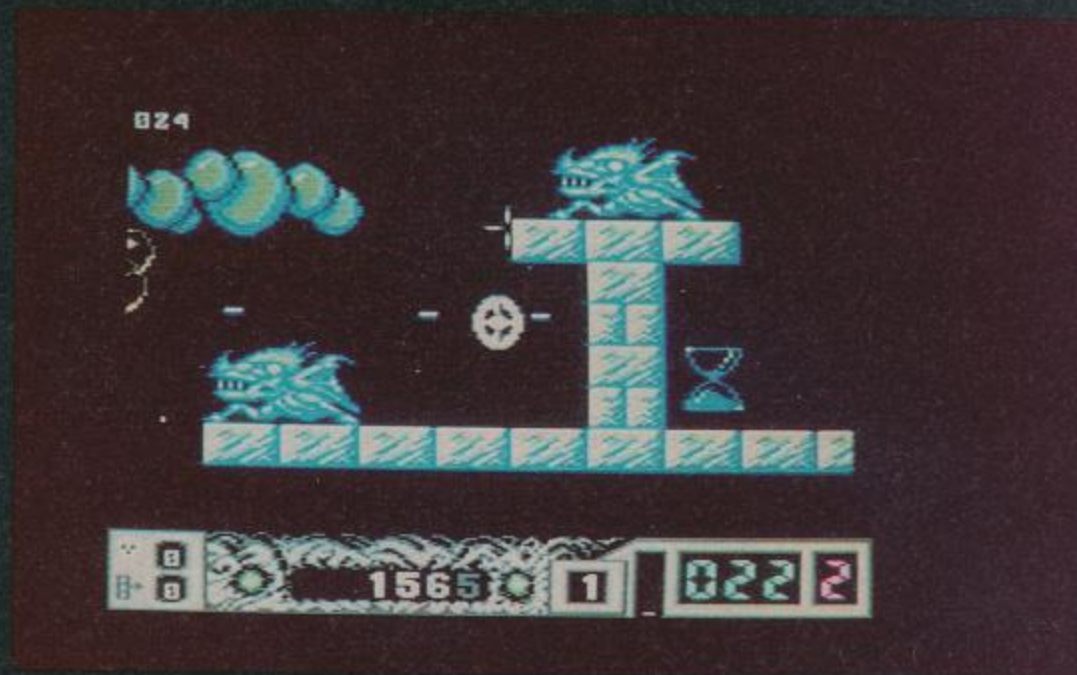
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Netherworld



I used to think chocolate milk was addictive! Netherworld is definitely a game to test your willpower as much as your joystick skills. I haven't been so hopelessly addicted to a game since Boulderdash (to which this game owes more than a passing resemblance). Jukka Tapanimaki may be testament to the programmer's art in Finland, but this man is obviously in need of psychiatric help!

Trapped in a fantasy world with nothing more than your multi-firing gyrosphere to protect you, the only way back to normality (?) is by battle and bribery. Acid, bubble-belching dragons are your worst enemy, but never forget that time is no friend either. Steer your ship around the maze, collecting diamonds and egg timers (the latter extends your time limit in your favour) until you have enough diamonds to bribe the guardians of the teleports into letting you proceed. Until then, you can only use the teleports for 'local' trips, these being quite useful once you've worked out where each one deposits you. Shooting acid bubbles can produce items that when collected, help you on your way, increase your score, or merely serve to hinder you.

After successfully completing level one, a devilishly tricky bonus round is your next task, although completion is not obligatory. By pushing moveable rocks into positions, the flying blob is directed into the converter grid a valuable extra life can be collected.

Levels two and beyond are infinitely more difficult with the inclusion of 'nasties' generators, alien eggs, moveable rocks and various other hinderances.

Although the game play is reminiscent (to me, anyway) of Boulderdash (collect-all-the-diamonds-and-the-exit-before-the-clock-runs-out), the graphics belong to the age of Uridium (ultra-smooth, ultra-fast scrolling) and IO (imagine-your-worst-enemy's-worst-nightmare). Your gyrosphere responds well under joystick control, its 'natural' inertia took quite a bit of getting used to - a lot like Paradroid (I don't like drawing comparisons like this but sometimes it's the only way!). Chancing the mystery bonus (after shooting acid bubbles) can provoke some weird results - your gyrosphere can suddenly respond back to front and upside down (inverting your joystick gets you out of this quite nicely) or you could lose control completely for a while. On the plus side, you could gain extra speed, a demon killer, or be able to knock out bricks. The latter two features are cumulative not to mention essential to solving the higher levels.

Soundwise, the inter-game music narrowly escapes 'disgustingly bad' but knocks spots off one or two Amiga soundtracks I could call to mind! Sound effects (muzee-speak ekwivelent = SOWNDEFX) are useful rather than tuneful - and so they should be.

Well done Hewson (nice press do), more of the same please! This Finnish geezer is pretty hot stuff - the bonus round is probably worthy of a game on its own! It's pretty rare for one of my reviews to have nothing but praise, so take a pat on the back all round. I only hope I can squeeze my meals in between attacks of Netherworld.....

F.R.

Touchline:

Product: Netherworld. **Supplier:** Hewson, 56B Milton Trading Estate Milton, Abingden, Oxon OX14 4RX. **Machine:** C64/128. **Price:** £7.99 (£14.99 disk).

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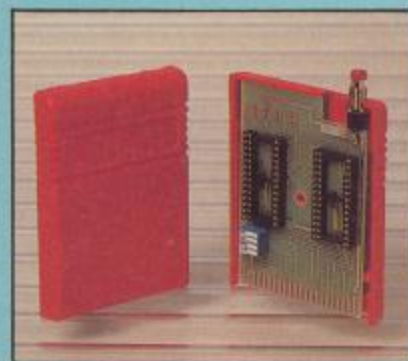
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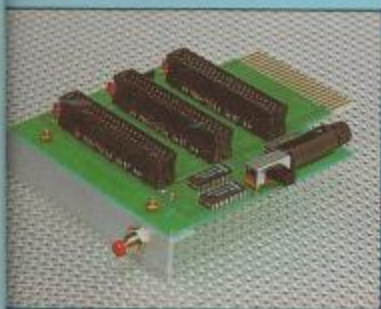
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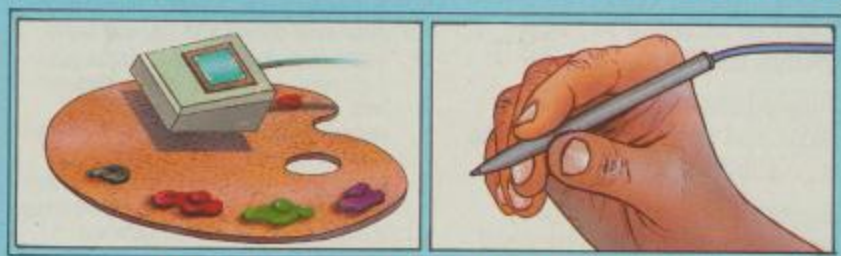


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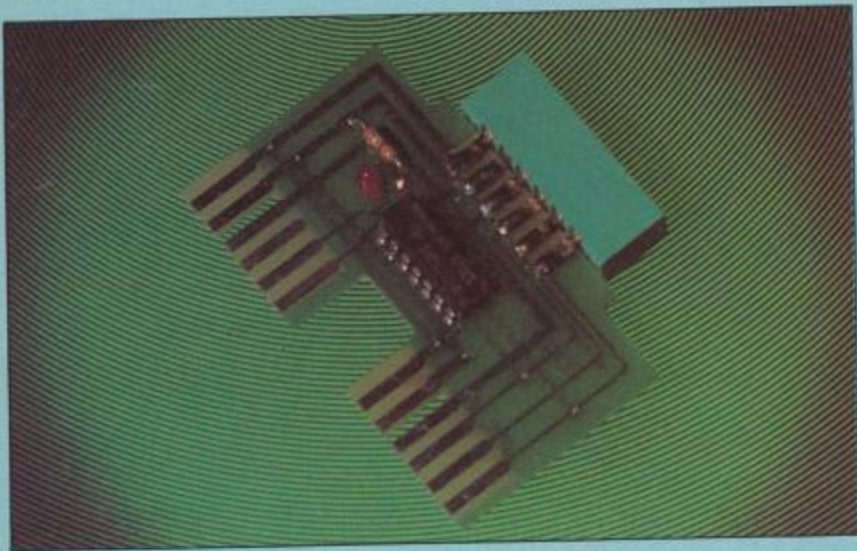


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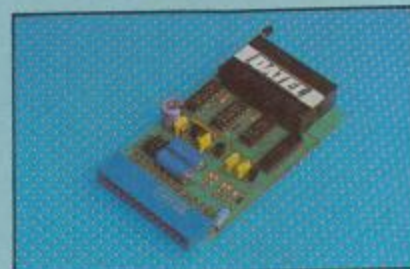
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Has there ever been a time when you've been so absorbed with programming your 64 that you've been totally unaware of the world outside? If so then help is at hand with this routine. Just type in Alarm and you'll never miss the start of your favourite telly program again or even worse last orders at the Dog and Fox

By Nick Gregory

Alarm turns the 64 into a digital alarm clock while still allowing you to use the computer normally. The program works on interrupts, checking every $\frac{1}{60}$ th of a second to see what time it is and whether or not its time to sound an alarm. There are four ways to use Alarm which I will demonstrate with examples:

SYS 49152

This turns off the Alarm routine and returns the C64 to normal.

SYS 49152, "P0800", "P1045", "LAST ORDERS NOW"

This sets the actual time to 8 o'clock pm and the alarm to 10.45pm. When 10.45 is reached then the message "LAST ORDERS NOW" will be flashed in the top left hand of the

screen. The message will be flashed on the screen until you use the first command (or RUN/STOP and RESTORE) to turn it off. You can set the time or alarm to am by using an 'A' rather than 'P' in the time string. For example "A1000" is 10 o'clock am.

The time strings must start with either an 'A' or a 'P' otherwise you will get a syntax error and they must contain the time in the format HHMM within the natural ranges otherwise you will get an illegal quantity error. The message can be anything you want up to 26 characters but it shouldn't contain control codes or cursor controls, just ordinary printable characters. Again if you exceed 26 characters you will get an illegal quantity error.

SYS 49152, "P0800", "P1045", "LAST ORDERS NOW", 1

This is exactly the same as the example above except that the time will be continually displayed in the top right hand of the screen. The time is printed in hours, minutes and seconds though you can not set the time to seconds. An 'A' or a 'P' is also displayed to tell you if it's am or pm. If the final value in this example is greater than one you will get an illegal quantity error, if it is zero then the command is the same as in the last example:

SYS 49152, "A0000", "A0010", "TEN MINUTES ARE UP"

This example shows how you can use Alarm to time specific periods. The alarm will go off in ten minutes time. It doesn't matter in this case if you use am or pm but the routine expects one or the other. Putting a 1 as the final value (as in the last example) will display the clock continually.

Before you set the times you should know how the clock works. The clock will tick away from A1200 to P1200; there are no A0010 except as I've just described above. For example, five minutes past mid-day is written as P1205 and five minutes to mid-day as A1155. Likewise five minutes past midnight will be A1205.

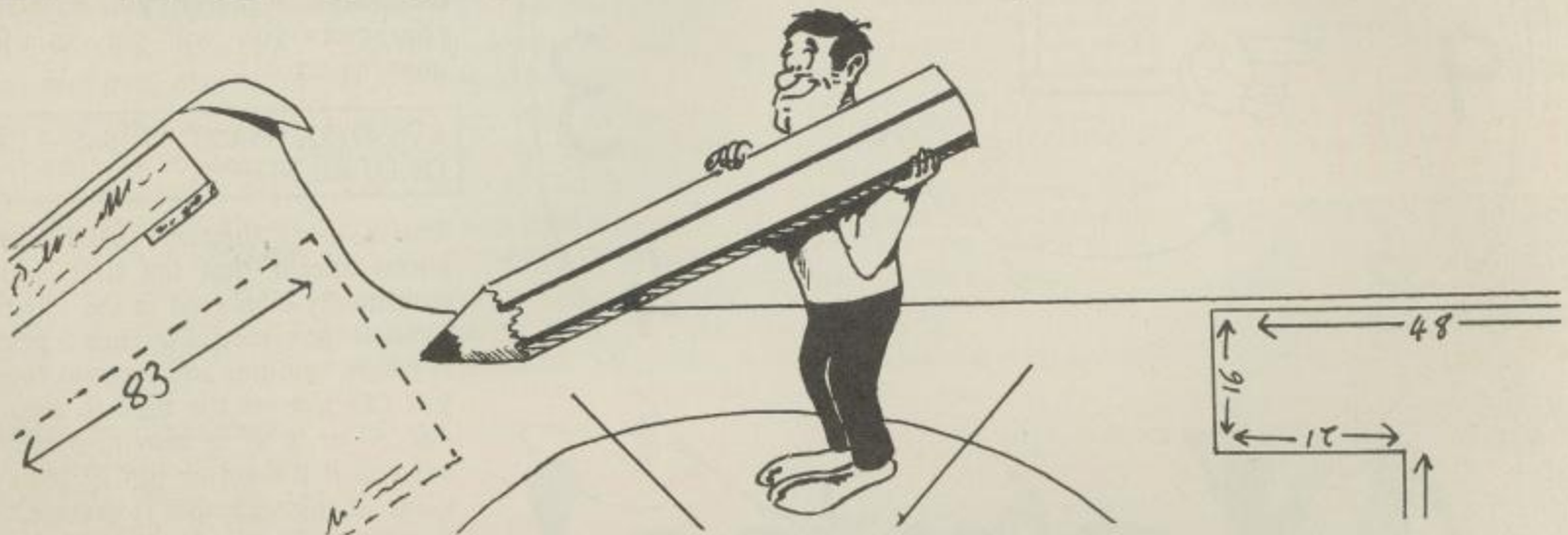
As Alarm is an interrupt routine you should be extra careful when typing it in because the 64 will most certainly hang up on you if you've made a mistake and remember the golden rule: SAVE BEFORE YOU RUN.

See listings on page 61

Hires/ Multicolour Plotter

*Sacrifice your horizontal resolution to combine
multicolour and high resolution mode*

By Daniel Ansari



None of the plot routines that I have so far seen in magazines were intended for use by the machine code programmer, neither were they able to be used in multicolour mode as well as hires mode. Multicolour mode is a nice feature of the Commodore 64, allowing up to four different colours to be used in a single character square, unlike the two colours in high resolution mode. There is, although, a sacrifice in horizontal resolution, which is halved to 160 pixels.

The routines available plot/unplot points, test them, draw/undraw boxes of any size and shape, clear the hires screen, enter hires mode, enter text mode, colour the whole screen, and load and save screens.

When used from Basic, the only POKE command needed is to tell the routine whether you wish to use hires mode, or multicolour mode. All the other instructions from now on are simple SYSs, with the parameters separated by commas. I have eliminated the need for several POKE instructions as well as an SYS, when one SYS and no POKEs greatly

POKE 254,m

Sets the mode, where m is 0 or 1 for hires or multicolour mode respectively.

SYS 49152,x,y,c,b

Turns a point, of co-ordinates (x,y), on or off. x is a number from 0-319, y a number from 0-199, and c the point colour; in multicolour mode it is a number from 0-15; in hires mode it is a number from 0-255 calculated by $16 * \text{point colour (0-15)} + \text{background colour (0-15)}$. b is the brush; in hires mode 1 or 0 for on or off; in multicolour mode 0 for off, or brush number 1-3.

JSR 49193

The machine code version of the above. Before using this instruction, store x in locations 50177-8 in the order LSB, MSB, and store y in 50179. c and b should be put in locations 50183 and 50184.

SYS 49340,x,y

Tests a point of co-ordinates (x,y). The number in location 50192 is 0 if the point is off, and greater than 0 if it is on. In hires mode, the number in 50193 gives the point colour and background colour together. The point colour is calculated by $\text{INT}(n/16)$, where n is the number. The background colour is $n - \text{INT}(n/16) * 16$ and can be calculated even if the point is off. In multicolour mode location 50193 contains the point colour (0-15). Tests a point. Only x and y are needed in locations 50177-9.

JSR 49378

SYS
49634,x,y,w,h,c,b

Draws/erases a box of top left co-ordinates (x,y) where w is the width (0- 319-x) and h is the height (0- 199-y).

simplify the task of creating graphics, and also make the process considerably faster.

From machine code, this is a little more complex. It is not possible to enter parameters separated by commas in this language, even though it is much faster. The values for the parameters must be POKEd into certain locations which are described later on. Every effort has been made to keep these locations down to an easily memorable level.

The demonstration program illustrates the capabilities of multicolour graphics reasonably well, but I'll leave it up to you to create your own masterpieces. If you do not have an assembler, then type in the Basic loader program. Don't worry if you make any mistakes - the program will tell you exactly where to find them.

When you have run your Basic loader program successfully, type in the memory save program and the plot routine will be saved to tape or disk.

The instructions to use are as follows, with SYS as the Basic instruction and JSR as the machine code (assembly language) instruction:

JSR 49675

SYS/JSR 49867

SYS/JSR 49897

SYS/JSR 49926

SYS 49951,s,t

JSR 49974

SYS 50005,d

JSR 50019

SYS 50128,d

JSR 50142

The m/c box instruction, where w is held in 50180-1 and h is held in 50182.

Clears the hires/multicolour screen at 8192.

Enters hires/multicolour mode, depending on the contents of location 254.

Enters text mode.

Sets screen and border colours, where s is the screen colour, and t is the border colour. In multicolour mode each parameter ranges from 0-15; in hires mode s is a number from 0-255, calculated by 16* point colour+background colour (the colours of all the points on the hires screen can be changed with this instruction); t is a number from 0-15.

Before using this instruction, load the x register with t, and location 253 with s.

Saves the hires/multicolour screen with device number d. d can be 1 or 8, for tape or disk. This instruction can only be used in program mode; this is because if a screen is saved in immediate mode it becomes corrupted as you type in the command.

The m/c save instruction. Load the x register with d. Loads the screen. Please note that the screen can be loaded while still in text mode.

Loads the screen from m/c. Load the x register with d before calling this routine. As with the save routine, this has to be used in program mode.

See listings on page 61

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Making Music

Commodore tell us that the SID (Sound Interface Device) Chip is a single-chip, 3-voice electronic music synthesiser/second effects generator compatible with the 6510 and similar microprocessor families. It has the following features: three tone oscillators in the range 0-4 kilohertz (one hertz is, you may recall, one cycle per second); four waveforms per oscillator, and these are of course our familiar triangle, sawtooth, pulse and white noise; three amplitude modulators, with a 48 decibel range; three envelope generators, featuring exponential response, an attack rate varying from two milliseconds to eight seconds, a decay rate varying from six milliseconds to 24 seconds, a sustain level varying from 0 to the peak volume level, and a release rate which also varies from 6 milliseconds to 24 seconds. They all, of course, vary from zero milliseconds to whatever the maximum setting might be. This was all seen to ample effect in the ADSR settings program.

Oscillator synchronisation, which we have simply referred to as synchronisation and which requires the voice being synchronised to be at a lower frequency than the one it is being synchronised with, but preferably at a higher frequency than zero!

Ring modulation, which we have dignified with the full term and which,

as we have seen, requires a triangle waveform in order to operate properly.

Filtering techniques, which again have been covered in some detail. Commodore call them oscillators, we call them voices!

However, these are just words, and actions (or at least tables) speak louder than words. The Commodore 64 manual obligingly gives us the high and low value frequency settings for a range of notes, but in order to obtain the frequency value of an unspecified note in a form suitable for turning into a high and low value frequency we must use the formula:

$$F = \text{Freq} / 0.06097$$

where Freq is the value we want, and F is the frequency of the note in question. Having got Freq we can find the high and low value frequencies (FH and FL) from the following equations:

$$FH = \text{INT}(F / 256)$$

$$\text{and } FL = F - (256 * FH)$$

All this assumes that F is an integer value, by the way.

The ADSR settings, with talk of milliseconds and seconds, sounds all very grand, but in terms of actual numbers and values to be POKEd into memory the following table tells us all we need to know:

Decimal	Hexadecimal	Attack	Decay/Release
0	0	2	6
1	1	8	24
2	2	16	48
3	3	24	72
4	4	38	114
5	5	56	168
6	6	68	204
7	7	80	240
8	8	100	300
9	9	250	750
10	A	500	1.5 secs
11	B	800	2.4 secs
12	C	1.0 secs	3.0 secs
13	D	3.0 secs	9.0 secs
14	E	5.0 secs	15.0 secs
15	F	8.0 secs	24.0 secs

The times given are all in milliseconds, unless otherwise specified.

You'll see from this table that not every setting is possible, although the number of different ADSR settings available (256 * 256, or 65536) should be more than enough for most people. It isn't, for example, possible to get an attack rate of 30 milliseconds, or a decay rate of 500 milliseconds, but such minor problems should really be overlooked in the face of what we have got.

Combine the number of possible ADSR settings with the number of different notes we can play, the variations on ring modulation and synchronisation, and in particular the number of different filter types and filter settings (combining resonance and cutoff frequencies of different values) and you'll soon realise that it is a foolish man who can claim to know all about the SID chip and its workings.

Conclusion

During the course of this foray into the inner workings of the SID chip we have encountered many musical marvels, and have come close to talking about everything that the chip is capable of doing. Envelopes, modulators, synchronisers, filters, have all been discussed, and the sound effects and musical tunes that we can produce have a virtually infinite range.

The major programs presented will help you to understand how the chip functions, and how its various features can be utilised to best effect.

However, in the end it is of course up to you, the user of the chip, to get the best out of it, and the only way to do that is by experimenting. No one can hope to commit to memory all of the wonderful effects that are available to us when using this chip. No, the only route is through continuous experimentation, fiddling about with programs, changing the values stored in registers, altering what goes where and seeing what happens as a consequence.

I encountered my first, very humble, 'synthesiser' program for the Commodore 64 back in the early months of 1983, over four years ago. I still use that program, and I'm still learning how the chip itself operates, and how I can ever possibly hope to understand all its inner workings and create every sound it's capable of. If you've just started, try not to despair!

See listings on page 61

In a month of sequels (Football Manager II, The Games - Winter Edition) non is more impressive than the sequel to Incentive's Driller, Dark Side.

This is the second in the games to feature the Freescape 3D system that creates solid images and gives you millions of possible views of those objects. The views you will see are of the moon Tricuspid which is the second moon of the planet Evath.

On its surface the Ketras are planning the destruction of Evath and are building a massive energy weapon called the zephyr one. This massive machine of destruction is powered by a line of Energy Collection Devices (ECD's). Your mission is to knock out the Zephyr one and your only chance of that is to destroy the ECD's that feed it with power.

As the game begins you are dropped on the light side but your quest lies on the dark side of the moon. There you will find ECD's and the Zephyr one that are guarded by Plexor tanks that automatically open fire when you come into range. Some regions that you will need to go are restricted and can only be reached through telepod towers but you will need to find telepod crystals to operate them.

First on your agenda must be to find shield plates for more protection and fuel rods to power your jetpac that can get you in and out of so much trouble.

The Freescape system almost gives you the feeling that you're there as you can fly over, around and into buildings and objects scattered around the planets surface. Inside the buildings you will find puzzles to solve and hidden trapdoors but the main puzzle will be how to knock out the ECD's. Although all you have to do is blast away its crystal at the top of the tower but unfortunately if the ECD you've

knocked out is connected to more than one other, and most are, it simply regenerates. Therefore, you must scout out the moon carefully to find the ends of the line.

However, time is also against you as the Zephyr one is already building up its power bringing the destruction of Evath closer and also making it more difficult for you to destroy.

The view of the planet is seen through the helmet of you the Evath agent which is dominated by the Freescape 3D view of the moon's surface but below that are instruments that show the co-ordinates of your current location, the sector you are in, a compass, and current shield and fuel levels.

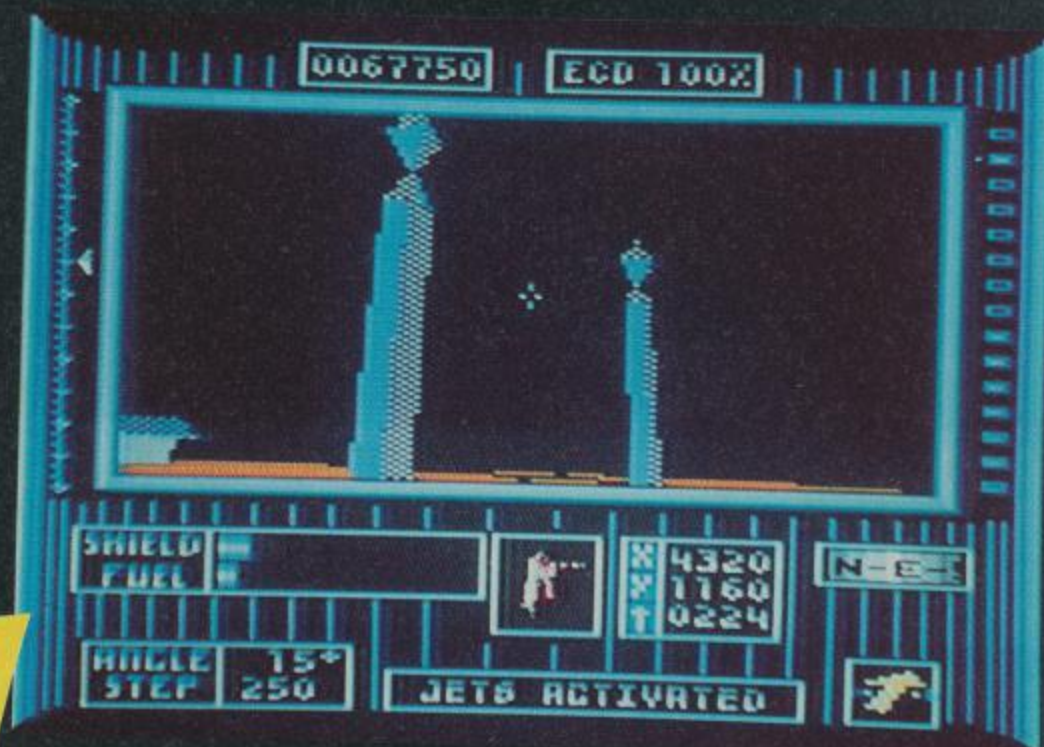
Once you've played your first game of Dark Side, Evath will have been destroyed and you in the vain attempt to save it but you will be convinced of two things. Firstly, it often takes a couple of games for a new system such as Freescape to settle down since it is only then that the development team concentrate on the plot and that Dark Side is one of those rare games that is both pretty to look at and a challenge to play.

T.H.

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Title: Dark Side.

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The President is Missing



The President is Missing not only launches an intriguing detective style investigation but also a new style in games from US software house Cosmi. Cosmi made the news a few weeks ago with its move from the US Gold stable when it signed a UK joint venture with Microprose which was also once imported by US Gold.

With the move it has left behind its old, less than subtle style of game, that included the blood and guts of Forbidden Forest and Aztec Challenge and the taste shown in games like Chernobyl. The President is Missing is a high quality investigation backed up with two double sided disks, an audio tape and booklets and documents to set the scene.

The President, and incidentally nine other western leaders, were supposed to be at a summit in Switzerland but the venue was switched at the last moment to somewhere in Lichtenstein. Last night two army helicopters carrying armed terrorists stormed the meeting place and abducted the leaders. Because of the grave crisis the Vice President has appointed you as Special Investigator making it your job to find out who perpetrated the abduction, bring them to justice and bring about the safe return of the leaders.

To help you in this onerous task you have access to the federal databases, agency reports, government documents, public and private records, intelligence files and a team of eight field agents. These files are stored on the four disk sides, but there is just so much information available that you must approach the case logically or get drowned in a sea of data.

A reasonable place to start is the official report of the kidnapping but more tempting is the audio tape included in the game box. This is packed with potential clues as well as a fair helping of red herrings, and includes recordings of phone taps, a speech made at Oxford University several

years earlier, ransom demands from the kidnappers and statements from the President and the French Premier. This piles on the atmosphere and sets you scribbling frantic notes about names and places that crop up and some intriguing morse code that appears at the end of the tape that was intercepted by your intelligence services that is guaranteed to send you racing for the encyclopedia to find out its meaning.

On side three of the disk there are ten photo files to send the investigating buds as you scour the images with the zoom option to look for the vital clue. Almost at once you're beginning to get suspicious.

The kidnappers claim to be Islamic fundamentalists and demand among other things the destruction of the state of Israel,

the withdrawal of western influences and puppet governments and the return of all Islamic assets. The voice of one of the kidnappers sounds similar to the speaker at Oxford who describes terrorists as heroes and freedom fighters. However, the meeting place was only disclosed to security agents and the leaders themselves hours before (they had only be warned of it being within 50 miles of Zurich) which suggests at least some inside knowledge and perhaps a traitor. Add to that the use of the abductors of Russian made gas bombs and a Russian trawler within range of where the abductors drop out of radar surveillance and you have the scope for some interesting theories.

However, theories on their own won't win the game and so you need to delve deeper into personal and private files and put your field agents to work. These can take any orders, go anywhere in the world and report back to you but the skill is deciding where to send them and ensuring their orders are clear enough to avoid time wasting and wild goose chasers.

The President is Missing is a fascinating game of international intrigue and although reminds you of the first part of the Fourth Protocol game the depth and attention to detail put it in a class of its own.

If solving the game isn't enough to satisfy your curiosity, and this should take several weeks of sleepless nights, then you can take up Cosmi's offer to send in your conclusions and evidence to help prosecute the offenders in return for the juries decisions.

T.H.

Touchline

Title: *The President is Missing.* **Supplier:** Cosmi (Microprose), 2 Market Place, Tetbury, Gloucs., GL8 8DA. **Tel:** 0666 54326. **Machine:** C64 disk. **Price:** £12.95.

Sprite Library

It's back to the ABC in this month's delve into the Library

By Mike Benn

The alphabet takes on a shady appearance this month. The individual characters are based on a single sprite definition. Use the table to decide which characters you need; they are in alphabetical order so it should be easy to calculate which letter you will need. The C64 allows up to eight sprites on the screen at any one time which should meet most needs. If you require more sprites on the screen, I recommend *Split Sprite* by S.J. Chance (YC April 1987) which allows up to 32 sprites on the screen at one time.

SAVE IT-DON'T RUN IT or it will self-destruct and, possibly, burst into flames. Before running the loader program you will need to reset the computer and type directly the following:

POKE43,0: POKE44,64: POKE16384,0:

NEW
and press return. This will trick the computer into believing that the basic now starts at \$4000 instead of \$0801. Load in the basic loader and run it; if error free, the program will

remember to add a 1 after the device number. The data is saved in the following location \$2800-\$37FF.

The sprites run from 160 to 223 in a compromise to avoid the area \$2000 traditionally set aside for redefined character graphics and to avoid the need of typing in line after line of data.

If only one or two sprites are required then use this formula: (Sprite block No. — 160) * 40 + 190 = the data line number at which that sprite blocks data starts. Remember to type in the following three lines of data and alter the variable BL to the number of data lines you have in your finished program, less 1.

The small basic program M. ALPH DISPLAY will variously animate the sprites in both non-expanded and expanded forms on the screen simultaneously. To hold on any sprite enter the same number for Start and End.

Any sprite Editor program will enable you to change and adapt the individual sprites to your own requirements.

See listings on page 61

YC

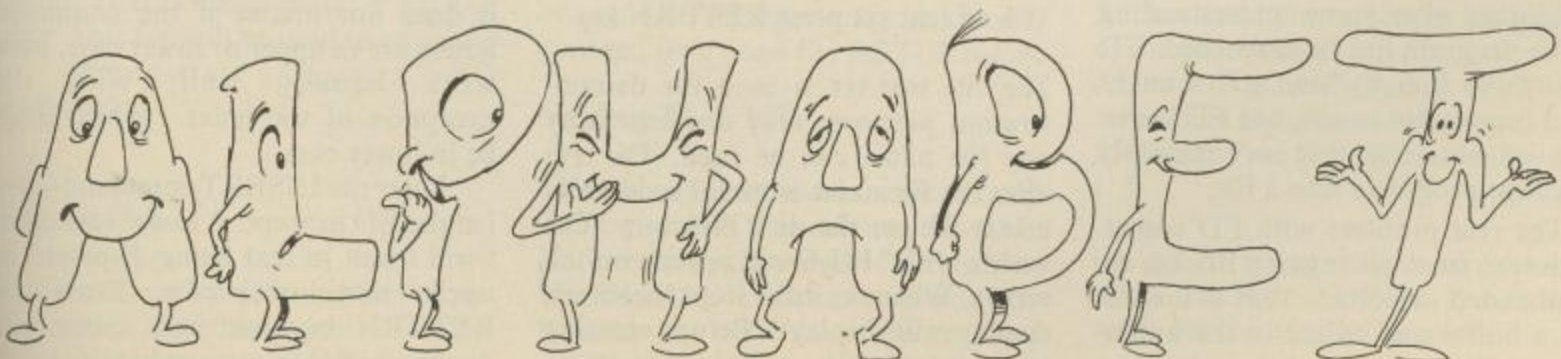
Multialph — Multicolour

HEX	DECIMAL	DESCRIPTION
A0 — B9	160 — 185	CAPITALS
BA — C3	186 — 195	NUMBERS
C4 — DD	196 — 221	SMALL LETTERS
DE	222	CIRCLE
DF	223	SQUARE

Getting it all in

Type the basic loader as published and

automatically save as a block of data.
If you reload that data in the future



The mysteries of the CP/M+ context editor explained

By Alan J. Wills

CP/M+

A few years ago I upgraded my trusty Commodore 64 for a new Commodore 128D. I was persuaded by slick advertising that I would be receiving three computers in one package. What really clinched the deal was the prospect of using CP/M+. I had worked with Wordstar, which runs under CP/M, and was excited by the prospect of using CP/M+ to run business programs from public domain software suppliers.

When my 128D arrived I immediately tried the CP/M+ system disk supplied with the computer. I was not impressed with the screen display and wondered how I could make use of my new operating system.

I soon found out that CP/M had many different formats and I would not be able to readily obtain programs from software suppliers. Indeed it became very obvious that I could do very little with CP/M+ unless I was prepared to study and work on practical exercises. The section on CP/M+ in the Commodore 128 handbook gave an inkling of what to expect, but no real guidance.

Recently I saw a series of articles on CP/M+ and the 128 in *Your Commodore*. I obtained a handbook on CP/M+ and over a few months I managed to glean enough information to use several of the transient programs supplied on the CP/M+ system disk.

Commands for operating the transient program, ED, will be demonstrated and it must be emphasised that only the basic commands will be shown. It will be up to the individual to progress onto more advanced techniques after some understanding of the program has been reached. ED is not "user friendly" and at first might seem impossible to use, but ED is one way of entering text or assembly language programs into a file.

The real problem with ED comes when text from an existing file has to be amended or edited. Text is loaded into a buffer and edited in the buffer before being saved to disk in its new

form. Unfortunately the cursor does not perform its usual role; instead a character pointer called CP, which is invisible, is used for positioning in the buffer. Think of the buffer as a graph with CP positioning across the top and line positioning down the left hand side. The text being the actual area where plotting takes place. However the CP must know where it is at all times, so it is important to set CP at the start of the buffer.

After using ED for some time its editing system will become familiar and although rather slow to use, with a great deal of counting necessary, it at least gives the user a method of entering text into a file without the added expense of a more advanced editor.

I have compiled a summary of ED commands used in this article and it would be useful to have them at hand for reference as the exercises are worked. To make sure that ED is on the CP/M+ disk enter DIR at the system prompt and check the directory for ED. If it is on the disk then remove the disk and switch off the computer.

Loading ED

The following instructions load ED into the computer memory from the system disk. Place the CP/M+ disk containing ED in the default drive then switch on the drive and the computer (only if 128D). The system disk will auto boot and stop with the CP/M+ system prompt A>. At the prompt enter the following:

```
>A ed text.txt press RETURN key
```

The file text.txt is used for demonstration purposes only and in reality any file name can be used. The .txt after the file name is useful to identify a text file on the disk directory. The words NEW FILE will appear on the screen. When the drive stops the screen display will display: * Before entering text into the file it is important to

understand the operating modes of the Ed program.

Operational Modes

ED has two modes - COMMAND and INSERT. In COMMAND mode the prompt displayed on the screen display is :*. In this mode commands can be entered one at a time or if more than one command is required in a continuous line with one command following the other, spaces are not required. Commands can be edited before the RETURN key is pressed. Use the CRSR right and left key to position the cursor then the DEL key to go to erase the character.

If the letter i is entered at the prompt and RETURN key pressed ED enters the INSERT mode. In this mode ED inserts text directly into the memory buffer.

ED will generate a line number for reference followed by the prompt ... Editing in this mode is carried out by moving the CP, which will be explained later. A complete line of text can be deleted by using the CURSOR DOWN key immediately above the £ key. Spaces can be inserted into the text, by using the SPACE BAR.

Entering Text on a File

The next step is to enter text into a disk file. WARNING - it is not an easy matter to correct mistakes after text has been entered into a file so it is worth checking the text before the RETURN key is pressed. At this stage it does not matter if the command letters are in upper or lower case, both work equally well, with the exception of the letter i which must be in lower case.

Enter the INSERT command letter i at the ED prompt. A lower case letter i will result in text being displayed in upper and lower case. Press the RETURN key and the screen will display l; ED is now waiting for text

Context Editor

to be entered into the buffer. Enter the following lines of text and press RETURN at the end of each line.

My dear son James, the head of the family,
died on 2 September 1834.
Thus death, or rather the conqueror of the last enemy,
has said, hitherto shall the immediate Branches of the
Family Tree go, and no further.

When line 6 prompt is displayed enter CONTROL Z (CONTROL key & Z together) and press the RETURN key. The CONTROL Z sequence will not be displayed on the screen. The screen display should now look like this:

```
A>ed text.txt
```

```
NEW FILE
```

```
:*i
```

```
1: My dear son James, the head of the family,  
2: died on 2 September 1834.  
3: Thus death, or rather the conqueror of the last enemy,  
4: Hath said, hitherto shall the immediate Branches of the  
5: Family Tree go, and no further.  
6: CONTROL Z (not displayed)
```

The CONTROL Z sequence switches off line numbering and forces ED to enter the COMMAND mode. To save the file for future use, enter the EXIT command letter E at the prompt and press the RETURN key. ED will save the file text.txt and make a backup copy. This file will be used in exercises to demonstrate various ED commands.

The Buffer

At this stage a brief description of the text buffer might help you to understand its complexity. Text is entered

directly into the memory buffer from the keyboard. The size of the buffer can be determined by the OV command entered at the prompt followed by the RETURN key; the display on the screen will give free space/buffer size. When the command is executed the screen will display 38271/38491. The LINE NUMBER command letter N allows movement through the lines of text in the buffer and is executed by entering a line number at the prompt.

The line selected is displayed on the screen; unlike the LINE command L which only goes to the line number and requires a further command to display text. The B command sets the CP at the start of the buffer and -B puts the CP at the end of the buffer. ED then enters the COMMAND mode and displays the command prompt :*. Enter B0P at the prompt to display text from the start of the buffer. The letter B moves the CP to the start of the buffer and 0 (figure 0) followed by the letter P displays half the buffer to the screen. The B0P command will be used extensively in the coming exercises to set the CP at the start of the memory buffer and print the file.

Viewing an Existing File

Now let's view the file text.txt created earlier and saved to the disk using the EXIT command. Before any viewing takes place the file MUST be loaded into the buffer. To do this use the APPEND command letter A is be used. Decide on how much text you want to view at one time and enter one of the A commands at the ED prompt, then press the RETURN key.

Saving Text File

You have already saved the file text.txt using the EXIT command letter E. Here are two other ways of saving files. The HEAD OF FILE command letter H, saves the contents of the memory buffer without leaving ED and sets the

CP at the start of the buffer. This allows re-editing without having to load ED again.

If you make a mess of the text file and want to return to the original file then use the ORIGINAL command letter O. This command will abandon all changes made to the text file and returns to the original file ready for re-editing, again without the ED session. The O command differs from the E and H commands as you are asked to confirm the validity of the command by the prompts O (Y/N). Enter Y or N and press the RETURN key and leave the computer and disk drive to do the rest.

Loading from an Existing File

Now to get down to the serious work of editing a text file. To re-call text previously entered into a file enter the following line at the system prompt:

```
>A ed text.txt      press RETURN key
```

ED will load the file text.txt ready for editing. Use the combined APPEND #A and PAGE 0P commands to display text on the screen from the buffer. The screen will display the following:

```
A>ed text.txt
:* #A0P
```

```
1: My dear son James, the head of the family,  
2: died on 2 September 1834.  
3: Thus death, or rather the conqueror of the last enemy,  
4: hath said, hitherto shall the immediate Branches of the  
5: Family Tree go, and no further.  
1: *
```

I'm afraid space doesn't allow us to print the whole article. Watch this space for the concluding part.

See listings on page 61

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Interceptor

All forms of combat have become much more remote as technology has improved. The Roman soldier certainly knew when he had killed someone as his victim was impaled only eighteen inches in front of his face. By the time a squaddie had a rifle in his hand, he was taking pot shots at people over half a mile away. If that person disappeared, the squaddie never knew whether he had hit his target or the man had just ducked down.

It is the same with air warfare. Gone are the days of the silk scarf, goggles and shouts of 'Tally-Ho Chaps' as you waved to your opponent before blasting him out of the skies. Now, all you get to see is a small blip on your radar screen at which let loose the odd missile or two. It is a bad show if you actually get to see your opponent.

Two of the latest killing machines are the F-16 Fighting Falcon and F/A-18 Hornet, pride of the American ground and naval forces respectively. Interceptor from Electronic Arts puts you in charge of either in their latest Amiga game.

As combat simulators go, Interceptor falls somewhere in the middle ground. You do not have to wade through

flight and the split-S. You had better be paying attention though for your next task is to demonstrate that you can perform the moves yourself.

A qualification mission follows. Take off from the deck of the carrier, fly around dealing with any enemy aircraft that happen to be in the vicinity before finding and landing on the carrier once more. Only a successful mission here results in you being passed fit for active duty.

The controls of your plane are reasonably straightforward with most of the keys used being sensibly arranged and easy to remember. e.g. R for range, T for target, M for map and so on. For once in games of this type, I found that the combination of joystick and keyboard easy to manage so that I could stay airborne long enough to be shot down rather than going into a power dive from thirty thousand feet as I struggled to find the right button to press! The head up display, which throws an image of all the vital information onto the canopy proved more than useful and saved forever having to look down at the instrument panel. Ironically, the control that gave me the most trouble was the security wheel, included in the package to stop piracy.

You have a variety of weapons available at your disposal - AMRAAM medium range missiles, Sidewinder short range missile and a close range cannon. Naturally, it would be unfair to expect your opponent to fight back armed only with a pea shooter so it is necessary to make use of chaff, flares and electronic counter measures in an attempt to divert the bad guy's missiles. The only problem with these is that they do tend to advertise your presence somewhat.

One of the most unusual features of Interceptor is the number of different views that you, the pilot can obtain. You can look out of your cockpit left or right, up or down and forwards or backwards. As if that wasn't enough, you can also get third person views of your aircraft, i.e. someone standing right next to you but outside the aircraft, again from the same bewildering set of angles. Why you should want to do this in actual combat, I haven't yet discovered, but you must admit, it does look impressive in the photographs!

Interceptor has got the balance just about right between complexity and gameplay and the game should provide many hours of entertainment to any would-be, latter-day Biggles. An excellent game.

G.R.H.



hundred page manuals before you discover how to take off. Nor is the documentation so sparse that you are literally flying on a wing and a prayer. Instead, there is a twenty four page manual, most of which is taken up with diagrams.

What the program does instead is to take you through a series of training flights. At the simplest of levels is free flight. There are no enemies or targets, just you alone in a big empty sky getting used to the controls of your aircraft.

The next stage is the easiest of all. You don't do anything as you sit beside your training officer as he demonstrates the seven basic combat manoeuvres - the aileron and barrel rolls, inside and vertical half loops, break turns, inverted

Touchline:

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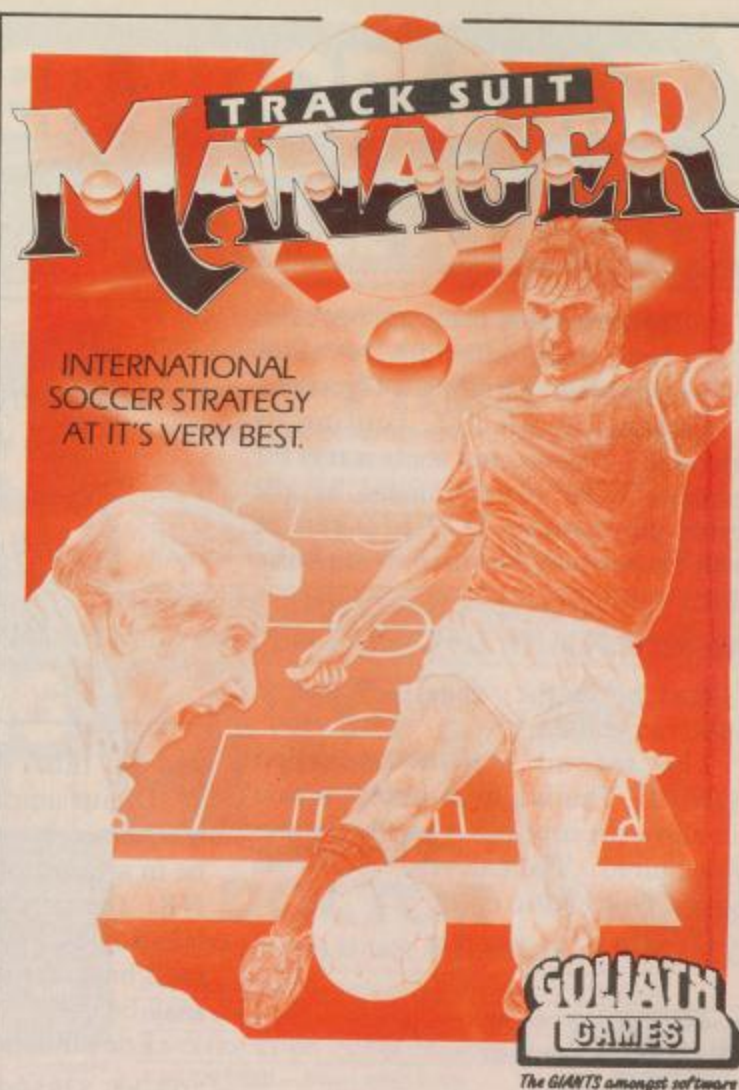
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COMMODORE 64, SPECTRUM

Jack in the Box!

The Box utility program provides four main functions to allow powerful handling of screens.

Firstly, a PRINT routine is provided. This is not necessary for machine code programmers as the kernal plot routine at \$FFF0 can be used. To position the cursor from Basic enter:

SYS 52797,X,Y

X must be in the range 0-39 and Y in the range 0-24.

The second routine is called CONFIG. This is a special routine that will allow the user to set up the utilities as required. To call the CONFIG routine from Basic enter:

SYS 52480,A,B,C,D,E,F

- A - Border colour
- B - Screen colour
- C - Ink colour
- D - Input ink colour
- E - Cursor colour
- F - ASCII code of cursor e.g. ASC(".") or 39

Calling the Config routine in machine code is slightly more complex. The parameters A to F must be set up by placing the required values in the locations below. This is done using LDA and STA in machine code.

- A - \$D020 - this is the standard border colour
- B - \$D021 - screen colour
- C - \$0286 - cursor colour
- D - \$CF68 - input colour
- E - \$CF69 - cursor colour
- F - \$CF6A - the cursor type

To call the Config routine enter JSR \$CD00.

Routine three is an input routine. The main advantage that this has over the standard Commodore input statement is that numeric input is masked. Only numbers are allowed in numeric input, letters and symbols are ignored.

The cursor type and colour are pre-set by the config routine (section 2). For basic users, the input routine is called by the following statement:

SYS 52814,TYPE,DIGITS

Type is a parameter. This shows the type of input. 1 is used for numeric

*A handy utility which
can be used by
Basic or machine
code programmers*

By S. Scott

and any other value for alpha.

Digits simply indicate the number of characters in the string. This must be in a range of 1 to 25.

NB: the input data is stored at location \$CF40 or 53056 decimal. To read back the data the following code may be used:

For numeric values:

```
10 SYS 52814,1,10
20 A$=""
30 FOR L=0 TO 9
40 A$=A$+CHR$(PEEK(L+53056))
50 NEXT L
60 A=VAL(A$)
70 PRINT"NUMBER INPUT";A
```

For strings:

```
10 SYS 52814,0,10
20 A$=""
30 FOR L=0 TO 9
40 A$=A$+CHR$(PEEK(L+53056))
50 NEXT L
60 PRINT"STRING INPUT ";A$
```

For machine code programmers, ensure that config has been set up. Set the X register to the number of digits and set location \$CF5E to the required value(0 or 1). Now call the routine at \$CE57 with a JSR statement. The input data is returned in location \$CF40 as above.

The final routine is called Box. It was created to allow multi-size rectangles to be drawn with ease and speed. The routine works by clearing the required area with spaces and drawing a box. The boxes give much enhancement to menus and the general display.

To draw a box in Basic, ensure the config routine has been called and then enter:

SYS 52517,A,B,C,D,E,F,G,H,

The parameters are:

A - the start X co-ordinate

B - finish X

C - start Y

D - finish Y

E and F - these values are used to specify additional lines. The lines are displayed horizontally, inline with the top and bottom lines. The values for E and F should fall between C and D.

G - this is the colour of the box in the range 0 - 15.

H - the parameter allows the boxes to be drawn in reverse(1) or not(any other value).

An example box might be:

SYS52517,10,30,5,14,7,12,1,1

Machine code programmers may use boxes by ensuring that config has been called and then setting the following locations to the required values:

- A - \$CF5F - Start X
- B - \$CF60 - Finish X
- C - \$CF61 - Start Y
- D - \$CF62 - Finish Y
- E - \$CF63 - Line 1
- F - \$CF64 - Line 2
- G - \$CF65 - Colour of box
- H - X-register - Reverse flag

When the parameters have been set, execute the routine at \$C057 with JSR \$C057.

Program Notes

The box routine has been kept compact to allow maximum memory usage by the programmer. Therefore, parameters are not fully checked for valid entries and invalid or high values may cause corruption of your data!

To make the box program even easier to use, the following basic lines can be adopted:

```
100 F=F+1
110 IFF=1 THEN LOAD"BOX UTILS",
    8,1
120 PRINT"8"
130 CO=52480 : REM CONFIG
140 BO=52517 : REM BOX
150 AT=52797 : REM PRINT AT
160 IN=52814 : REM INPUT
    ROUTINE
```

See listings on page 61

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What programs are available?

At the top of each article you will find a strap containing the article type, C64 Program etc. So that you can see which programs are available on which format, you will also find a couple of symbols after this strap. The symbols have the following meaning:



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These programs are available on disk.

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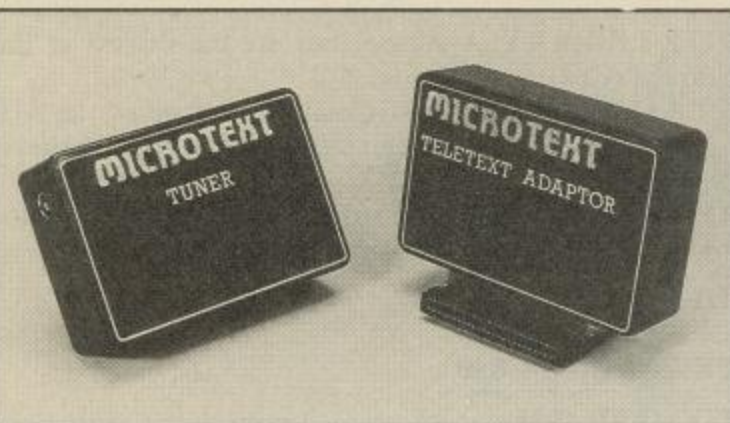
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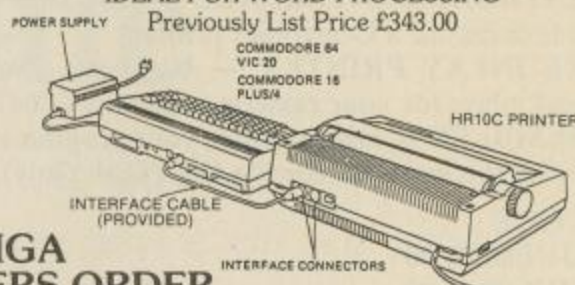


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Access Prestel, Micronet, CityService etc. Works with any user-port RS232 interface and 1200/75 modem.

CENTRONICS CABLE 64, 128 ... £18.99

Compatible with Easyscript, Superscript etc. Driver for BASIC on disk or tape*.

6502 ASSEMBLER 64 or Plus/4* tape/disk £12.99

A sophisticated two-pass symbolic assembler and text editor which supports tape and disk filing. The assembler, editor, source and object code may all be resident in memory simultaneously, facilitating rapid and interactive code development. Very fast edit/Assembler/test cycles.

Z80 EMULATOR/ASSEMBLER 64 disk £12.99

A unique integrated Z80 development package. The emulator compiles Z80 source code into optimised 6502 which runs on the 64 at about one sixth the speed of a 2MHz Z80. The cross-assembler generates hex or binary Z80 object files. The disk contains a powerful editor and example programs.

Please specify* options. Send cheque/PO. or order by access.
Prices include VAT and P&P. Overseas orders add £2.50.
Allow up to 1 week for delivery.



YORK ELECTRONIC RESEARCH

The Fishergate Centre, Dept YC, 4 Fishergate, York YO1 4AB
Tel (0904) 610722

I honestly thought we'd left this kind of gratuitous violence safely behind us – obviously I was wrong (a hard thing for a journalist to admit)! Alright, *Commando* was good fun for a while, but it's been well and truly done to death (no pun intended). The scenario is totally predictable – fight your way up the screen shooting everything and everybody in your way to assassinate mad despotic General Fernandez and free the state of El Diablo from his tyrannical rein.

Fernandez Must Die was written by none other than the legendary Tony 'Ratt' Crowther and David 'Bish' Bishop – obviously on the train on their way to the publishers! If you read this Tony, I hope you're ashamed of yourself!

Back to the game – the action takes place on a vertically scrolling map, viewed from the air. From time to time, planes fly over dropping bombs, supplies and enemy soldiers. These you should avoid, collect and shoot respectively. Abandoned jeeps are abundant, affording you a small measure of protection as well as getting you quickly from A to B. Your soldier is armed with a machine gun and hand grenades, and can make use of the Jeep's cannon if you have any shells (collect some along the way) to blow holes in the walls of the compounds, these can then be searched for hidden gold, prisoners, supplies, etc; before blowing them up. There are eight such bases, blowing them all up wins you the game, but should you fail you could be awarded a medal or two (posthumously).

The music is not brilliant, not even tolerable – 'sufferable' might come closer. Sound effects during the game are the predictable bangs and crashes, nothing particularly noteworthy.

This has been a difficult review to write, having absolutely nothing good to say about it. At the same time, some of you are going to buy this game no matter what I think. So if you like mindless violence, *Fernandez Must Die* is the game for you.

F.R.

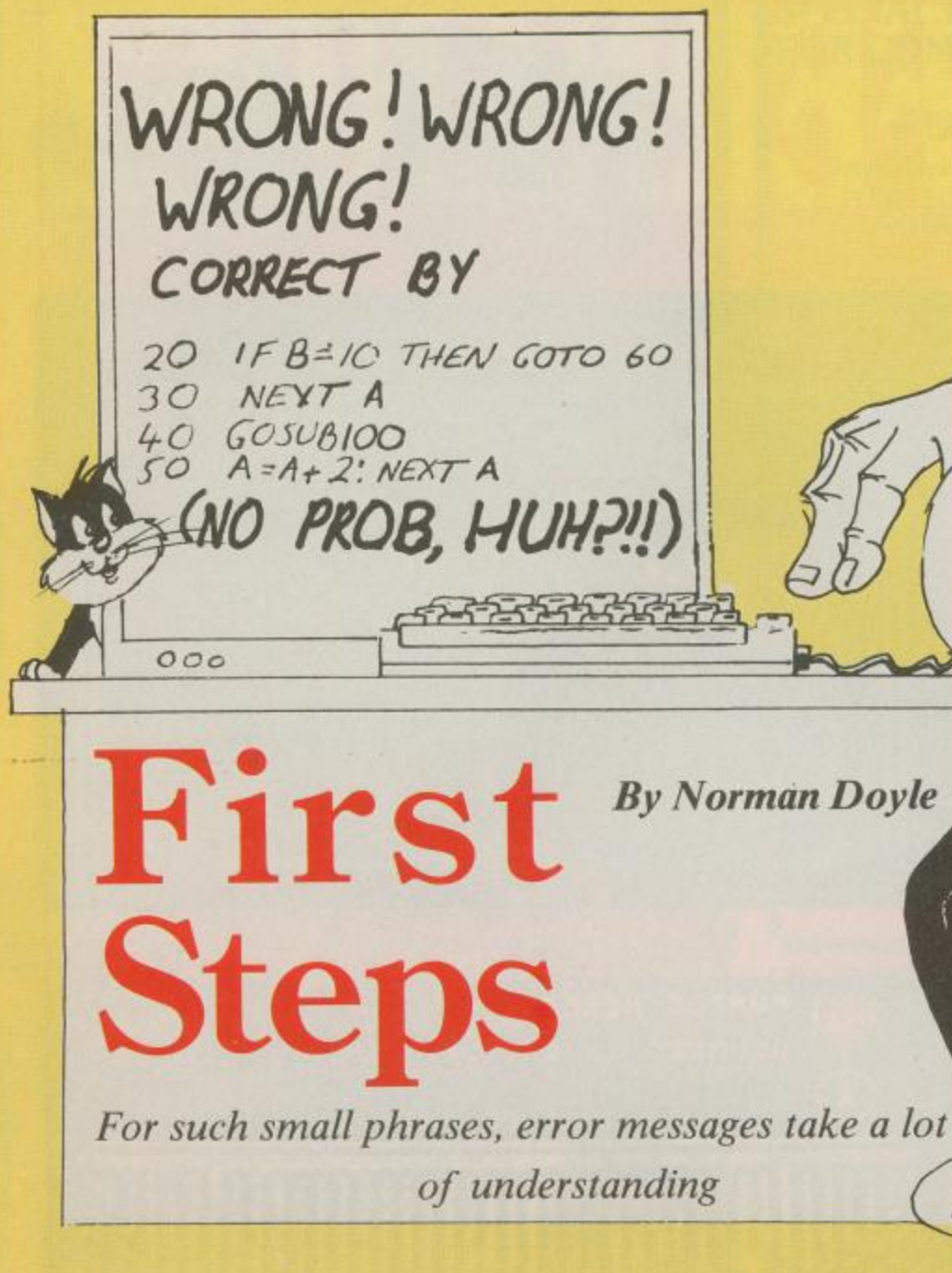
Touchline:

Product: *Fernandez Must Die* **Supplier:** Image Works, Headway House, 66-73 Shoe Lane, London EC4P 4AP. **Price:** £9.99 (tape), £12.99 (disk) **Machine:** C64/128.

FERNANDEZ



MUST DIE



First Steps

By Norman Doyle

For such small phrases, error messages take a lot of understanding

Error messages are actually devised to help rather than hinder progress. This article completes our look at file problems and tackles the errors that can arise with calculations.

NOT INPUT FILE

Occurrence: program error

Generated after an INPUT # or GET # command, this means that the file number refers to an output file. In other words the file was opened as a write only file.

NOT OUTPUT FILE

Occurrence: program error

Similar to the previous error, this appears when the wrong type of file is accessed by the PRINT command.

The only solution for both of these problems is to first of all check that the command does describe the required action and that the file number is correct. If everything checks out, then the file must be closed and re-opened as the correct type.

FILE DATA

Occurrence: program/file error

When numeric data is expected from a file read command but string data is returned instead, this is the error message that appears. First of all check that the file is the right one and then alter the INPUT # or GET # command structure to handle the data correctly.

For some obscure reason, the C64 manual refers to this as the BAD DATA error message.

MISSING FILE NAME

Occurrence: user error

This only occurs when operating with a device number greater than three and is generated when a null string is given as the filename. This can only be done by using the syntax: LOAD " ",8. On cassette this would be a valid filename and would load the first program file encountered. The equivalent disk command is an asterisk or a colon followed by an asterisk.

ILLEGAL DEVICE NUMBER

Occurrence: user error

There are only two device numbers which cause this error: zero and three. These correspond to the screen and the

keyboard which cannot be saved to or loaded from. With sequential files the operating system is blind to device numbers and will apparently accept any syntactically correct statement regardless.

Printers are not input devices but the operating system will still allow an attempt to load. Trying to save to a printer produces interesting results!

Legal device numbers range from zero to 255 but values less than 63, or between 128 and 191 generate a DEVICE NOT PRESENT error if the device is not connected. An attempt to access devices with any of the remaining values will be executed whether the device exists or not.

If a device number of 256 is used the error generated is ILLEGAL QUANTITY.

LOAD

Occurrence: operating system or user intervention

This indicates that a load has failed. The causes can be a faulty disk or tape, a permanent or temporary electrical fault or the pressing of the RUN/STOP key to abort a load.

The electrical fault may be as simple as a bad connection at the cassette port or a transient power spike. Spikes are caused by heavy load equipment such as central heating systems, cookers or fridges causing a feedback into the main. This usually causes the visual display to jump and a loud click is heard through the speaker.

Another cause can be misaligned tape heads. As time goes by, the playback/record head can move slightly and the tape signal misses the read head slightly. This results in a loss of 'volume' which the computer can only tolerate to a certain degree. Once the signal becomes so quiet that this threshold is reached, the tape may start reading until natural tape movement pulls the signal down below the cassette recorder's threshold of 'hearing'.

Alternatively, the drive band in the cassette may be worn out. This causes the tape to vary in speed ruining the precise signal timing that the computer relies on to make sense of the data. Similarly, a motor fault would produce the same effect.

The solution to spikey mains signals is to unplug the offending equipment or to fit a smoothing mains

filter socket for the computer equipment.

Alignment problems can be cured by a datasette doctor system which will help to diagnose and possibly correct the fault.

Disk faults result from similar causes to cassette faults but correction of alignment or speed problems is more difficult to solve. Disk drive alignment kits are available but they're more difficult to use. Given that the disk is faulty anyway, one may be worth a try. Care must be taken however because the drive plugs directly into the mains and a 240V shock could be at the least painful, at worst fatal.

VERIFY

Occurrence: operating system or user intervention

A verify error usually occurs because the disk or tape program is not the same as the one in the computer's memory. If this is definitely not the case, the device has one of the faults outlined under LOAD errors.

This completes the catalogue of cassette based errors but there are plenty of problems which can be experienced with disk drives. The C128, C16 and Plus/4 computers all have special handling systems to report these faults but C64 users will have to rely on the flashing red LED warning light on the drive. A cartridge or a disk operating system, such as the one supplied on the TEST/DEMO disk, can correct this problem.

All of the remaining errors in the C64's repertoire are programming errors. The specialised C128, C16 and Plus 4 errors will be covered in a later article.

Mathematical Errors

Mathematical operations follow very strict rules; all of which cannot be detected by the operating system. Use of statements such as $4*5+1$ are valid when the required answer is 21 but invalid when the programmer means that four is to be multiplied by the result of five plus one. This should be correctly written as $4*(5+1)$. Such undetectable programmer errors are not the concern of the computer's operating system and care in the use of brackets is an essential skill to master.

ILLEGAL QUANTITY

This occurs when a number is used

which goes beyond the allowable range for an integer variable or exceeds the 255 range of file numbers, device numbers and other such values.

The allowable range for integers is -32768 to +32767 inclusive. If a calculation is expected to exceed these limits it is best to use the more usual floating point method (A rather than A%).

OVERFLOW

An overflow error only occurs when the result of a floating point calculation exceeds plus or minus 1.7014118345E+38.

No errors are generated with negative exponential (E) values which exceed 2.93873588E-39. This is because lower decimal values represented in this way are very small indeed, having 38 zeros between the decimal point and the string of numbers preceeding the E value. Unfortunately, exceeding this value results in the variable becoming zero, so calculations should be kept well within the limit to ensure maximum accuracy.

DIVISION BY ZERO

Although dividing by zero is not permitted, dividing zero by another number is allowed but gives a value of zero.

FORMULA TOO COMPLEX

This can occur under numerous circumstances but basically means that the computer cannot cope with the mathematical formula as it is presented.

Correction involves breaking the calculation down into easily assimilated sub-calculations or to use fewer brackets if at all possible.

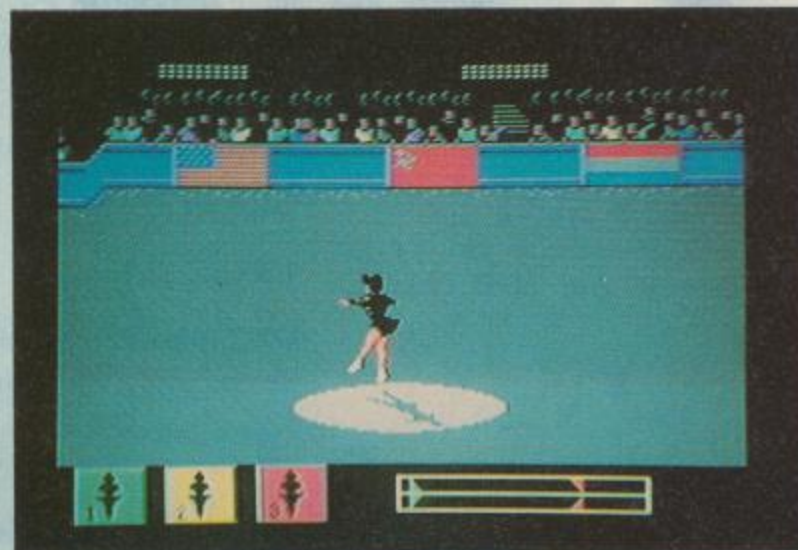
UNDEF'D FUNCTION

All FN functions must be defined before they are used. This may sound like commonsense but it can be easily done when a program is created in modular form using subroutines.

The way to avoid the error is to define all functions within the first few lines of every program. If a function is necessary at line 1000 of a program, go back and add a line as near to the beginning as possible to set up the FN formula.

Next month we'll be covering errors associated with GET and INPUT, including problems posed by mixing strings and numerical data. VC

The Games – Winter Edition



First there was Summer Games, then its sequel Summer Games II which were quickly followed by Winter, World and California Games. Now just when you thought it was safe to pick up your joystick out comes The Games – Winter Edition.

Seven more events await joystick athletes in the first of the many games set to jump on the Olympic bandwagon but why is the Winter Edition released now in the Summer when you just know there's a Summer Edition coming in the winter?

These new "games" games are as a result of Epyx's success in capturing the Olympic licence and the Winter Edition includes a combination of snow, skis, skates and ice which will prove irresistible to those aspiring to the greatness of top athletes such as Eddie "the Eagle" Edwards.

Many of the seven events in the Winter Edition appeared in Winter Games but are now more involved games demanding more than a sequence of joystick moves.

As with the previous games, up to eight players can compete for gold, silver and bronze medals and to set new world records. You can also practise any event or compete in one or more.

The luge is the first event and hurling yourself down a track on a

small piece of wood seems the ideal way to end the contest, not start it. But you must steer your luge down one of four packed snow tracks faster than anyone else by steering it down the middle of straights and riding corners as much as you can without clipping the edges which will cost you valuable seconds.

Cross Country skiing also gives you a choice of courses that range from one to five kilometres and is basically the Winter Games Biathlon without the shooting and is the most disappointing of all events as a simple left. Right rhythm will ensure a good time.

The ice skating is far more involved than its Winter games equivalents as now you must choose your music and plan your program of moves before performing it in the Olympic arena. A selection of jazz, rock and pop ensure a mixture of beats to plan your double axels, spins and falls to. Then in the performance you have to perform the right move at the right time in the music to score maximum points.

For true Eddie Edwards action you should try the Ski Jump with its new jumper perspective of the slide down the slope before you hopefully soar into the air for a medal leaping jump or plummet and land in a heap in the snow.

The slalom course is just as

treacherous as you must ski between the flags. Timing is vital but the inconsistent spacing of the flags means a simple rhythm just won't work.

Speed skating seems like an obvious event to include and many were surprised that it was left out of the original Winter Games but now it's back for those who want head to head racing action. In this event beating a computer pacer isn't quite as satisfying as crossing the finishing line while your human opponent is face down in the ice.

The final event is for the extroverts of the skiing world as TV cameras line the route of the downhill. The course is mapped out with flags that you must steer between to stay on your skis but when you come in range of the cameras you can show off with a few flips and jumps. Naturally, it's the one with the fastest time that will take the gold but it helps to get the crowd on your side.

The medals are presented to the winners in true Olympic fashion with the first three on pedestals, the gold medal winners national anthem playing as the flags are unfurled.

More stirring stuff from Epyx.

Touchline:

T.H.

Title: The Games – the Winter Edition.
Supplier: Epyx (US Gold), Units 2/3, Holford Way, Holford, Birmingham, B6 7AX. Tel: 021-356 3388. **Machine:** C64. **Price:** £9.95.



Listings

*Get it right first time with our deluxe program system
for the C64.*

You may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the funny numbers by the side of each line of the listing. Fret no more, it's all part of our easy entry aid.

Instead of those nasty graphics and rows of countless spaces in PRINT statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll soon learn to decipher their meanings.

For example, [SA] would mean type in a Shifted A, or an ace of spades in layman's terms, and [SA10] would mean a row of ten of these symbols.

[S+2] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realise that [C+2] means exactly the same thing except that the Commodore key (bottom left of the keyboard) is held down instead of the shift key.

If more than two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [SSPC4]. Translated into English this means press the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as:
[CTRL N, DOWN2, LEFT5, BLUE, F3, C3]

This would be achieved by holding

down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked BLUE while holding down the CTRL key, press the F3 key and, finally hold the Commodore key down while pressing the number two key (C2 would of course make the computer print in brown).

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears:
[SS],[C*]

In this case the two characters should have a comma between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark (SHIFT & 2) and delete it. This gets the computer out of quotes mode. Hold down CTRL and press the number nine key (RVSON), type the relevant number of reversed T's and then hold down CTRL and press zero (RVSOFF). Next type another quotation mark and delete it again. Now finish the line and press RETURN.

A list of these special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT string: the symbol for pi. This may appear when its value is needed in a calculation so this may look something like:

:CC=2*[PI]*R:

Ignore the square brackets and just type in a shifted upward pointing arrow (ie. the pi symbol).

PROGRAM: SYNTAX CHECKER

5 REM SYNTAX CHECKER - ERIC DOYLE

10 BL=10 :LN=70 :SA=49152
20 FOR L=0 TO BL:GX=0:FOR D=0 TO 15

30 READ A:IF A>255THENPRINT"NUMBER TO LARGE":LN=(L*10):STOP
40 GX=GX+A:POKE SA+L*16+D,A:NEXT D

50 READ A:IF A<GX THENPRINT"ERROR IN LINE":LN=(L*10):STOP
60 NEXT L:SYS 49152:NEW

70 DATA 173,5,3,201,165,208,31,1
20,169,9,141,32,208,141,33,208,1847

80 DATA 169,7,141,134,2,169,13,3
2,210,255,169,64,141,4,3,169,1682

90 DATA 192,141,5,3,88,96,120,16
9,124,141,4,3,169,165,141,5,1566

100 DATA 3,169,14,141,134,2,141,
32,208,169,6,141,33,208,88,96,1585

110 DATA 32,124,165,72,138,72,15
2,72,162,0,165,20,133,254,165,21,1747

120 DATA 24,101,254,133,254,189,
0,2,240,18,69,254,133,254,232,189,2346

130 DATA 0,2,240,8,24,101,254,13
3,254,232,208,233,169,1,141,134,2134

140 DATA 2,165,254,74,74,74,74,3
2,156,192,32,210,255,165,254,41,2054

150 DATA 15,32,156,192,32,210,25
5,169,13,32,210,255,169,13,32,210,1995

160 DATA 255,169,7,141,134,2,104,
168,104,170,104,96,24,105,48,201,1832

170 DATA 58,16,1,96,24,105,7,96,
0,0,0,0,0,0,0,403

by Eric Doyle

Checksum Program

The hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can use our line checking program.

Type in the Checksum Program, make sure that you've not made any mistakes and save it to tape or disk

immediately because it will be used with most of the present and future listings appearing in Your Commodore.

At the start of each programming session, load Checksum and run it. The screen will turn brown with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and

















press RETURN again.

If you want to turn off the checker simply type SYS49152 and the screen will return to the familiar blue colours. You can then do whatever it was you wanted to do and if this doesn't use the area where Checksum lies you can go back to it with the same SYS command.












No system is foolproof but the chances of two errors cancelling one Many of the listings are presented in lower case. To turn your computer to lower case mode press the Commodore key and the SHIFT key at the same time.

YC

Mnemonic Symbol Keypress

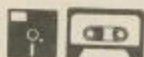
[RIGHT]		CRSR left/right
[LEFT]		SHIFT & CRSR left/right
[DOWN]		CRSR up/down
[UP]		SHIFT & CRSR up/down
[F1]		f1 key
[F2]		SHIFT & f1 key
[F3]		f3 key
[F4]		SHIFT & f3 key
[F5]		f5 key
[F6]		SHIFT & f5 key
[F7]		f7 key
[F8]		SHIFT & f7 key
[HOME]		CLR/HOME
[CLR]		SHIFT & CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 0

Mnemonic Symbol Keypress

[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8
[POUND]		£
[LARROW]		←
[UPARROW]		↑
[PI]		SHIFT & ↑
[INST]		SHIFT & INST/DEL
[REV T]		see text
[Cletter]		CBM + letter
[Sletter]		SHIFT + letter

Listings

SPRITE LIBRARY



PROGRAM: MULTIALPH DISPLAY

```

85 10 REM*****
31 20 REM* SPRITE LIBRARY DISPL
   AY *
81 30 REM*      MULTIALPH
   *
CB 40 REM*****
FF 50 POKES5,0:POKE56,40:X=X+1:
   IFX=1THENLOAD"MULTIALPH",8,1

E9 60 P0=70:P1=150:P2=118:P3=15
   0:P4=180:P5=150:P6=248:P7=15
   0:S=160:E=199:D=250
76 70 V=53248:PRINT"[CLR,WHITE,
   DOWN26,RIGHT9,RVSONJF7 TO ST
   OP ANIMATION"
84 80 POKEV+21,15:POKEV+23,10:P
   OKEV+28,15:POKEV+29,12:POKEV
   +32,3:POKEV+33,3
63 90 POKEV+37,0:POKEV+38,15:PO
   KEV+39,2:POKEV+40,2:POKEV+41
   ,2:POKEV+42,2:POKEV,P0
B7 100 POKEV+1,P1:POKEV+2,P2:PO
   KEV+3,P3:POKEV+4,P4:POKEV+5,
   P5:POKEV+6,P6:POKEV+7,P7
1A 110 INPUT"[HOME,DOWN]START S
   PRITE";S:INPUT"END SPRITE";E
   :INPUT"DELAY";D
13 120 FORSP=STOE:FORI=0TOD:NEX
   T:PRINT"[HOME]"TAB(23)"SPRIT
   E NO.=";SP:POKE2040,SP
67 130 POKE2041,SP:POKE2042,SP:
   POKE2043,SP:NEXT:GETKS:IFKS=
   "[F7]"THEN110
34 140 GOTO120
  
```

PROGRAM: MULTIALPH DATA

```

AF 10 REM*****
B1 20 REM* SPRITE LIBRARY
   *
30 30 REM* -----
   *
6F 40 REM* MULTIALPH SPRITES
   *
  
```

```

JE 50 REM* BASIC DATA LOADER
   *
99 60 REM* SPRITES DESIGNED BY
   *
2E 70 REM*      MIKE BENN
   *
CS 80 REM*****
DD 90 BL=255 :LN=190 :SA=1024
   0
89 100 FOR L=0 TO BL:CX=0:FOR D
   =0 TO 15
4F 110 READ A:IF A>255THENPRINT
   "NUMBER TO LARGE";LN+(L*10):
   STOP
98 120 CX=CX+A:POKE SA+L*16+D,A
   :NEXT D
D9 130 READ A:IF A<CX THENPRIN
   T"ERROR IN LINE";LN+(L*10):S
   TOP
37 140 NEXTL:POKE43,0:POKE44,40
   :POKE45,0:POKE46,56
05 150 SAVE"MULTIALPH",8,1:END
EF 160 REM*****
3B 170 REM TAPE USERS WILL NEED
   TO CHANGE      DEVICE N
   UMBER FROM 8 TO 1
FB 180 REM*****
4F 190 DATA 0,0,0,0,0,0,0,42,0,
   0,170,128,2,166,160,6,674
6C 200 DATA 145,160,6,129,160,6
   ,129,160,6,129,160,6,170,160
   ,6,170,1702
AA 210 DATA 160,6,149,160,6,129
   ,160,6,129,160,6,129,160,6,1
   29,160,1655
A9 220 DATA 6,129,160,10,162,16
   8,26,166,168,21,69,80,0,0,0,
   190,1355
52 230 DATA 0,0,0,0,0,0,10,170,
   0,26,170,128,22,150,160,6,84
   2
62 240 DATA 129,160,6,129,160,6
   ,129,160,6,129,160,6,170,144
   ,6,170,1670
6B 250 DATA 64,6,149,128,6,129,
   160,6,129,160,6,129,160,6,12
   9,160,1527
8E 260 DATA 6,129,160,10,170,14
   4,26,170,64,21,85,0,0,0,0,25
   5,1240
C3 270 DATA 0,0,0,0,0,0,0,42,32
   ,0,170,96,2,166,160,6,674
09 280 DATA 145,160,6,129,160,6
   ,129,160,6,129,64,6,128,0,6,
   128,1362
AE 290 DATA 0,6,128,0,6,129,160
   ,6,129,160,6,129,160,6,129,1
   60,1314
A2 300 DATA 6,161,160,5,170,144
   ,1,106,64,0,85,0,0,0,0,144,1
   046
CF 310 DATA 0,0,0,0,0,0,10,170,
   0,26,170,128,22,150,160,6,84
   2
AB 320 DATA 129,160,6,129,160,6
   ,129,160,6,129,160,6,129,160
   ,6,129,1604
  
```

```

A9 330 DATA 160,6,129,160,6,129
   ,160,6,129,160,6,129,160,6,1
   29,160,1635
7D 340 DATA 6,129,160,10,170,14
   4,26,170,64,21,85,0,0,0,0,20
   7,1192
C1 350 DATA 0,0,0,0,0,0,10,170,
   160,26,170,160,22,149,160,6,
   1033
C8 360 DATA 129,160,6,129,64,6,
   128,0,6,128,0,6,170,128,6,17
   0,1236
BF 370 DATA 128,6,149,0,6,128,0
   ,6,128,0,6,128,0,6,128,160,9
   79
AD 380 DATA 6,129,160,10,170,16
   0,26,170,160,21,85,64,0,0,0,
   127,1288
D9 390 DATA 0,0,0,0,0,0,10,170,
   160,26,170,160,22,149,160,6,
   1033
D0 400 DATA 129,160,6,129,64,6,
   128,0,6,128,0,6,170,128,6,17
   0,1236
88 410 DATA 128,6,149,0,6,128,0
   ,6,128,0,6,128,0,6,128,0,819
12 420 DATA 6,128,0,10,160,0,26
   ,160,0,21,64,0,0,0,0,127,702
E3 430 DATA 0,0,0,0,0,0,0,42,32
   ,0,170,96,2,166,160,6,674
63 440 DATA 145,160,6,129,160,6
   ,129,64,6,128,0,6,128,0,6,12
   8,1201
37 450 DATA 0,6,130,168,6,134,1
   68,6,133,160,6,129,160,6,129
   ,160,1501
4F 460 DATA 6,161,160,5,170,144
   ,1,106,64,0,85,0,0,0,0,2,904
93 470 DATA 0,0,0,0,0,0,10,162,
   168,26,166,168,22,133,160,6,
   1021
80 480 DATA 129,160,6,129,160,6
   ,129,160,6,129,160,6,170,160
   ,6,170,1686
F1 490 DATA 160,6,149,160,6,129
   ,160,6,129,160,6,129,160,6,1
   29,160,1655
E7 500 DATA 6,129,160,10,162,16
   8,26,166,168,21,69,80,0,0,0,
   95,1260
F5 510 DATA 0,0,0,0,0,0,0,42,12
   8,0,106,128,0,90,0,0,494
D7 520 DATA 26,0,0,26,0,0,26,0,
   0,26,0,0,26,0,0,26,156
4F 530 DATA 0,0,26,0,0,26,0,0,2
   6,0,0,26,0,0,26,0,130
DF 540 DATA 0,26,0,0,106,128,0,
   106,128,0,85,0,0,0,0,84,663
08 550 DATA 0,0,0,0,0,0,0,10,16
   0,0,26,160,0,22,128,0,506
99 560 DATA 6,129,0,6,128,0,6,1
   28,0,6,128,0,6,128,0,6,676
02 570 DATA 128,0,6,128,0,6,128
   ,0,6,128,0,6,128,10,6,128,80
   8
DD 580 DATA 26,6,128,22,170,128
   ,1,170,0,1,84,0,0,0,0,232,96
   8
  
```


LISTINGS

99 590 DATA 0,0,0,0,0,0,10,160,
160,26,162,160,22,130,160,6,
996
6B 600 DATA 138,144,6,138,64,6,
170,0,6,169,0,6,168,0,6,164,
1185
95 610 DATA 0,6,168,0,6,170,0,6,
154,0,6,154,128,6,154,160,1,
118
15 620 DATA 6,150,160,10,166,16
8,26,166,168,21,69,80,0,0,0,
22,1212
F3 630 DATA 0,0,0,0,0,0,10,160,
0,26,160,0,22,128,0,6,512
F1 640 DATA 128,0,6,128,0,6,128,
0,6,128,0,6,128,0,6,128,798
EA 650 DATA 0,6,128,0,6,128,0,6,
128,0,6,128,160,6,129,160,9
91
35 660 DATA 6,129,160,10,170,16
0,26,170,160,21,85,64,0,0,0,
253,1414
2B 670 DATA 0,0,0,0,0,0,42,0,42
106,128,170,90,128,168,26,9
00
ED 680 DATA 162,168,26,162,168,
26,106,104,26,106,104,26,88,
104,26,24,1426
59 690 DATA 104,26,20,104,26,0,
104,26,0,104,26,0,104,26,0,1
04,774
D9 700 DATA 26,0,104,42,128,170
106,129,170,85,1,85,0,0,0,4
6,1092
B3 710 DATA 0,0,0,0,0,0,42,2,16
8,106,6,168,90,133,160,26,90
1
EA 720 DATA 129,160,26,161,160,
26,161,160,26,161,160,26,169
160,26,105,1816
22 730 DATA 160,26,105,160,26,9
0,160,26,26,160,26,26,160,26
22,160,1359
66 740 DATA 26,6,160,42,5,160,1
06,1,160,84,1,64,0,0,0,190,1
005
E9 750 DATA 0,0,0,0,0,0,42,0,
0,170,128,2,166,160,6,674
B2 760 DATA 149,160,6,133,160,6
129,160,6,129,160,6,129,160
6,129,1628
CF 770 DATA 160,6,129,160,6,129
160,6,129,160,6,129,160,6,1
29,160,1635
FD 780 DATA 6,162,160,5,170,144
1,106,64,0,85,0,0,0,0,72,97
5
05 790 DATA 0,0,0,0,0,0,10,170,
0,26,170,128,22,150,160,6,84
2
FS 800 DATA 129,160,6,129,160,6
129,160,6,129,160,6,170,144
6,170,1670
E3 810 DATA 64,6,148,0,6,128,0,
6,128,0,6,128,0,6,128,0,754
24 820 DATA 6,128,0,10,160,0,26
160,0,21,64,0,0,0,0,122,697
24 830 DATA 0,0,0,0,0,0,42,0,
0,170,128,2,166,160,6,674
9A 840 DATA 145,160,6,129,160,6
129,160,6,129,160,6,129,160
6,129,1620
5E 850 DATA 160,6,129,160,6,138
160,6,154,160,6,154,160,6,1
50,160,1715
89 860 DATA 6,166,160,5,170,168
1,106,104,0,85,104,0,0,80,1
58,1313
35 870 DATA 0,0,0,0,0,0,10,170,
0,26,170,128,22,150,160,6,84

2
25 880 DATA 129,160,6,129,160,6
129,160,6,129,160,6,170,144
6,170,1670
AB 890 DATA 64,6,168,0,6,170,0,
6,154,128,6,150,128,6,134,12
8,1254
5C 900 DATA 6,134,128,10,165,16
0,26,161,160,21,65,64,0,0,0,
193,1293
B1 910 DATA 0,0,0,0,0,0,42,32
0,170,96,2,166,160,6,674
85 920 DATA 149,160,6,129,160,6
129,160,6,129,64,5,160,0,1,
104,1368
CD 930 DATA 0,0,90,0,0,22,128,0
5,160,6,129,160,6,129,160,9
95
B1 940 DATA 6,162,160,6,170,144
6,106,64,5,85,0,0,0,0,151,1
065
32 950 DATA 0,0,0,0,0,0,10,170,
160,26,170,160,25,105,96,20,
942
AE 960 DATA 104,64,0,104,0,0,10
4,0,0,104,0,0,104,0,0,104,68
8
90 970 DATA 0,0,104,0,0,104,0,0
104,0,0,104,0,0,104,0,520
39 980 DATA 0,104,0,1,170,0,1,1
70,0,1,84,0,0,0,0,208,739
74 990 DATA 0,0,0,0,0,0,0,0,1
0,162,168,26,166,168,22,722
4B 1000 DATA 133,160,6,129,160,
6,129,160,6,129,160,6,129,16
0,6,129,1608
DF 1010 DATA 160,6,129,160,6,12
9,160,6,129,160,6,129,160,6,
129,160,1635
BE 1020 DATA 6,162,160,5,170,14
4,1,106,64,0,85,0,0,0,0,151,
1054
31 1030 DATA 0,0,0,0,0,0,0,0,0,
10,0,40,26,0,104,26,206
3D 1040 DATA 128,168,22,129,160
6,129,160,5,129,128,1,162,1
28,1,166,1622
A4 1050 DATA 128,1,166,128,1,16
6,128,1,102,0,0,102,0,0,106,
0,1029
ES 1060 DATA 0,106,0,0,106,0,0,
88,0,0,16,0,0,0,0,149,465
01 1070 DATA 0,0,0,0,0,0,42,128
170,106,129,170,90,1,104,26
966
DD 1080 DATA 8,104,26,24,104,26
42,104,26,106,104,26,106,10
4,26,166,1102
EE 1090 DATA 168,26,166,168,26,
133,168,26,129,168,26,129,16
8,26,1,104,1632
EE 1100 DATA 26,0,104,26,0,88,2
4,0,24,16,0,16,0,0,0,7,331
FE 1110 DATA 0,0,0,0,0,0,2,128,
160,6,129,160,6,129,160,6,88
6
B7 1120 DATA 166,128,5,166,128,
1,166,128,1,106,0,0,106,0,0,
106,1207
0B 1130 DATA 0,0,106,0,0,102,0,
0,166,128,0,166,128,2,166,16
0,1124
F3 1140 DATA 6,149,160,6,129,16
0,6,129,160,5,1,64,0,0,0,52,
1027
D9 1150 DATA 0,0,0,0,0,0,10,0,1
60,26,130,160,26,134,160,22,
828
E5 1160 DATA 134,128,6,134,128,
6,134,128,6,134,128,5,134,0,
1,134,1340
E7 1170 DATA 0,1,170,0,1,170,0,
1,106,0,0,104,0,0,104,0,657

49 1180 DATA 0,104,0,0,104,0,0,
104,0,0,80,0,0,0,0,192,584
D4 1190 DATA 0,0,0,0,0,0,2,170,
160,6,170,160,6,149,160,6,99
9
03 1200 DATA 129,160,5,1,160,0,
1,160,0,2,128,0,10,0,0,40,79
6
8B 1210 DATA 0,0,160,0,2,128,0,
6,128,0,6,128,0,6,128,160,85
2
4A 1220 DATA 6,129,160,6,170,16
0,6,170,160,5,85,64,0,0,0,18
6,1307
B3 1230 DATA 0,0,0,0,0,0,42,0
0,170,128,2,166,160,6,674
3C 1240 DATA 149,160,6,133,160,
6,161,160,6,169,160,6,169,16
0,6,154,1765
44 1250 DATA 160,6,154,160,6,15
0,160,6,134,160,6,133,160,6,
129,160,1690
49 1260 DATA 6,162,160,5,170,14
4,1,106,64,0,85,0,0,0,0,9,91
2
ED 1270 DATA 0,0,0,0,0,0,10,0
0,42,0,0,106,0,0,158
0B 1280 DATA 106,0,0,90,0,0,26,
0,0,26,0,0,26,0,0,26,300
86 1290 DATA 0,0,26,0,0,26,0,0,
26,0,0,26,0,0,26,0,130
80 1300 DATA 0,42,128,0,106,128
0,106,128,0,85,0,0,0,0,89,8
12
37 1310 DATA 0,0,0,0,0,0,170,
128,2,170,160,6,170,160,6,97
2
E1 1320 DATA 161,160,6,129,160,
5,1,160,0,2,160,0,10,160,0,4
2,1156
27 1330 DATA 128,0,170,0,0,168,
0,2,160,0,6,128,160,6,129,16
0,1217
27 1340 DATA 6,170,160,6,170,16
0,6,170,160,5,85,64,0,0,0,23
4,1396
3F 1350 DATA 0,0,0,0,0,0,2,170,
160,6,170,160,6,150,160,6,99
0
9C 1360 DATA 130,128,5,74,128,0
10,0,0,42,0,0,170,128,1,170
986
CA 1370 DATA 128,1,86,160,0,1,1
60,0,1,160,2,129,160,6,130,1
60,1284
56 1380 DATA 6,170,128,5,170,12
8,1,106,0,0,85,0,0,0,0,252,1
051
78 1390 DATA 0,0,0,0,0,0,10,1
28,0,26,128,0,42,128,0,462
78 1400 DATA 106,128,0,170,128,
1,166,128,1,166,128,2,166,12
8,6,150,1574
93 1410 DATA 128,6,134,128,10,1
70,168,26,170,168,26,170,168
21,86,144,1723
C7 1420 DATA 0,10,160,0,26,160,
0,26,160,0,21,64,0,0,0,169,7
96
BD 1430 DATA 0,0,0,0,0,0,2,170,
160,6,170,160,6,170,160,6,10
10
34 1440 DATA 149,160,6,129,160,
6,129,64,6,168,0,5,170,0,1,9
0,1243
7E 1450 DATA 128,0,22,160,0,5,1
60,0,1,160,6,129,160,6,130,1
60,1227
21 1460 DATA 6,170,160,5,170,12
8,1,106,0,0,85,0,0,0,0,19,85
0
AE 1470 DATA 0,0,0,0,0,0,42,0
0,170,128,2,166,160,6,674

▶

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168
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9,7
70,
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1,9
5,1
0,1
,12
,85
2,0
4

SAMPLER 64

Continued from last issue

PROGRAM: DATA 3

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0,0,0,0,0,0,0,0
39 2440 DATA 0,0,0,0,0,0,0,0,10
    ,130,160,26,134,160,22,134,7
    76
30 2450 DATA 128,6,134,128,6,13
    4,128,6,134,128,6,134,128,6,
    138,128,1472
12 2460 DATA 6,170,128,5,170,16
    0,1,166,160,1,69,64,0,0,0,0,
    1100
3C 2470 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
88 2480 DATA 0,0,0,0,0,0,0,0,10
    ,0,160,26,1,160,22,1,380
2B 2490 DATA 128,6,2,128,6,134,
    128,6,134,128,5,134,0,1,170,
    0,1110
D6 2500 DATA 1,170,0,1,104,0,0,
    104,0,0,80,0,0,0,0,2,462
04 2510 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
52 2520 DATA 0,0,0,0,0,0,0,0,42
    ,40,168,106,105,168,90,105,8
    24
FD 2530 DATA 160,26,105,160,26,
    105,160,26,105,160,26,105,16
    0,26,170,160,1680
2C 2540 DATA 26,170,160,22,105,
    128,4,81,0,0,0,0,0,0,0,0,696

6C 2550 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
6F 2560 DATA 0,0,0,0,0,10,2,128
    ,26,6,128,26,6,128,26,138,62
    4
AC 2570 DATA 128,22,154,0,5,168
    ,0,1,168,0,2,170,0,6,154,0,9
    78
0A 2580 DATA 6,154,128,10,22,12
    8,26,6,128,21,5,64,0,0,0,223
    ,921
A5 2590 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,10,162,168,26,366
DC 2600 DATA 166,168,22,133,160
    ,6,129,160,6,129,160,6,130,1
    60,6,162,1703
19 2610 DATA 160,6,170,160,5,17
    0,160,1,105,160,0,85,160,2,1
    28,160,1632
59 2620 DATA 6,130,160,5,170,12
    8,1,106,0,0,84,0,0,0,0,146,9
    36
B3 2630 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
BF 2640 DATA 0,0,2,170,160,6,17
    0,160,6,166,160,6,149,160,6,
    133,1454
E9 2650 DATA 160,5,2,128,0,10,1
    28,0,42,0,0,168,0,2,160,160,
    965
5C 2660 DATA 6,130,160,6,170,16
    0,6,170,160,5,85,64,0,0,0,32
    ,1154
EB 2670 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
00 2680 DATA 0,0,0,10,0,0,42,12
    8,0,42,128,0,170,160,1,170,8
    51
2B 2690 DATA 160,1,170,160,1,17
    0,160,1,170,160,1,170,160,1,
    106,128,1719
37 2700 DATA 0,106,128,0,26,0,0
    ,21,0,0,0,0,0,0,0,101,382
33 2710 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
EF 2720 DATA 0,0,0,170,160,1,17
    0,160,1,170,160,1,170,160,1,
    170,1494
65 2730 DATA 160,1,170,160,1,17
    0,160,1,170,160,1,170,160,1,
    170,160,1815
BA 2740 DATA 1,170,160,1,170,16
    0,1,85,64,0,0,0,0,0,0,0,812

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95 5 CH=0:L=9905
0B 10 POKE53280,0:POKE53281,0
5E 20 PRINT"[CLR]"
15 30 PRINT"DATA LOADER 3"
1A 40 PRINT"[HOME,DOWN2]POKE LO
    CATION:"L
61 50 FOR I=1 TO 8
9A 60 READ A
9A 65 IF A<0 THEN 120
F0 70 POKEI,A:CH=CH+A:L=L+1
D2 80 NEXT
4E 90 READ SUM
3D 100 IF SUM<>CH THEN PRINT"CHE
    CKSUM ERROR IN LINE"PEEK(64)
    *256+PEEK(63):STOP
9A 110 CH=0:GOTO 40
F6 120 PRINT"READY TO SAVE PROG
    RAM"
E9 130 PRINT:PRINT"PRESS RETURN
    "
AE 140 GETA$:IFA$(<>CHR$(13))THEN
    140
35 150 PRINT"[CLR]POKE 43,1:POK
    E44,8:POKE45,0:POKE46,54:SAU
    E"+CHR$(34);
92 160 PRINT"SAMPLER64"+CHR$(34)
    +",8"
4E 170 POKE631,19:POKE632,13:PO
    KE198,2
C6 500 DATA 0,0,0,0,0,0,0,0,0,
    0
A3 501 DATA 0,0,0,0,0,0,6,1,1,8
B4 502 DATA 6,0,0,0,0,0,0,0,0,6
0B 503 DATA 0,0,0,0,0,0,0,0,0,0
0A 504 DATA 0,0,0,0,0,0,0,0,0,0
01 505 DATA 1,1,1,1,1,1,1,1,8
D9 506 DATA 1,1,1,1,0,6,1,1,12
1E 507 DATA 6,0,0,0,0,0,14,14,3
    4
AA 508 DATA 14,14,14,14,14,14,1
    4,14,112
B0 509 DATA 14,14,14,14,0,0,1,1
    ,58
44 510 DATA 1,1,1,1,1,1,1,1,8
3E 511 DATA 1,1,1,1,0,6,1,1,12
B1 512 DATA 6,0,0,0,0,0,0,0,6
70 513 DATA 0,0,0,0,0,0,0,0,0
B5 514 DATA 0,0,0,0,0,0,1,1,2
BE 515 DATA 1,1,1,1,1,1,1,1,8
CC 516 DATA 1,1,1,1,0,6,1,1,12
53 517 DATA 6,0,0,0,0,0,14,14,3
    4
39 518 DATA 14,14,14,14,14,14,1
    4,14,112
5B 519 DATA 14,14,14,14,0,0,1,1
    ,58
71 520 DATA 1,1,1,1,1,1,1,1,8
C9 521 DATA 1,1,1,1,0,6,1,1,12
7F 522 DATA 6,0,0,0,0,0,0,0,6
BE 523 DATA 0,0,0,0,0,0,0,0,0
BF 524 DATA 0,0,0,0,0,0,1,1,2
B4 525 DATA 1,1,1,1,1,1,1,1,8
AE 526 DATA 1,1,1,1,0,6,1,1,12
F9 527 DATA 6,0,0,0,0,0,14,14,3
    4
C3 528 DATA 14,14,14,14,14,14,1
    4,14,112
B8 529 DATA 14,14,0,0,0,0,0,0,2
    8
23 530 DATA 0,1,1,1,1,0,0,0,4
B0 531 DATA 0,0,0,0,0,0,6,1,1,8
65 532 DATA 6,0,0,0,0,0,0,0,6
24 533 DATA 0,0,0,0,0,0,0,0,0
EB 534 DATA 0,0,0,0,0,0,0,0,0
EA 535 DATA 0,0,0,0,0,0,0,0,0
0F 536 DATA 0,0,0,0,0,0,6,1,1,8

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A3 537 DATA 6,6,0,0,0,0,0,0,12
AF 538 DATA 0,0,0,0,0,0,0,0,0
AE 539 DATA 0,0,0,0,0,0,0,0,0
AD 540 DATA 0,0,0,0,0,0,0,0,0
9A 541 DATA 0,0,0,0,0,0,6,1,1,8
2F 542 DATA 6,6,6,6,6,6,6,6,48
2E 543 DATA 6,6,6,6,6,6,6,6,48
2D 544 DATA 6,6,6,6,6,6,6,6,48
2C 545 DATA 6,6,6,6,6,6,6,6,48
14 546 DATA 6,6,6,6,6,6,6,1,1,38
9E 547 DATA 1,1,1,1,1,1,1,1,8
9D 548 DATA 1,1,1,1,1,1,1,1,8
9C 549 DATA 1,1,1,1,1,1,1,1,8
D3 550 DATA 1,1,1,1,1,1,1,1,8
DC 551 DATA 1,1,1,1,1,1,1,0,7
D9 552 DATA 0,0,0,0,0,0,0,0,0
D8 553 DATA 0,0,0,0,0,0,0,0,0
9F 554 DATA 0,0,0,0,0,0,0,0,0
9E 555 DATA 0,0,0,0,0,0,0,0,0
9D 556 DATA 0,0,0,0,0,0,1,0,1
9C 557 DATA 0,0,0,0,0,0,0,0,0
C3 558 DATA 0,0,0,0,0,0,0,0,0
C2 559 DATA 0,0,0,0,0,0,0,0,0
C1 560 DATA 0,0,0,0,0,0,0,0,0
C0 561 DATA 0,0,0,0,0,0,0,0,0
07 562 DATA 0,0,0,0,0,0,0,0,0
06 563 DATA 0,0,0,0,0,0,0,0,0
05 564 DATA 0,0,0,0,0,0,0,0,0
04 565 DATA 0,0,0,0,0,0,0,0,0
48 566 DATA 0,0,0,0,0,0,0,0,0
4A 567 DATA 0,0,0,0,0,0,0,0,0
49 568 DATA 0,0,0,0,0,0,0,0,0
34 569 DATA 0,0,0,0,0,0,0,169,1
    69
F8 570 DATA 5,133,1,120,169,11,
    141,17,597
7C 571 DATA 208,169,176,162,0,1
    41,6,220,1082
95 572 DATA 142,7,220,173,13,22
    0,169,25,969
F3 573 DATA 141,15,220,173,13,2
    20,41,16,839
3F 574 DATA 201,0,240,11,169,15
    ,141,24,801
A9 575 DATA 212,32,59,240,76,28
    ,240,169,1056
39 576 DATA 0,141,24,212,32,59,
    240,76,784
E5 577 DATA 28,240,160,0,145,25
    ,1,230,251,1305
79 578 DATA 208,8,230,252,165,2
    52,201,208,1524
C1 579 DATA 240,1,96,76,112,243
    ,0,169,937
25 580 DATA 0,133,251,169,12,13
    3,252,76,1026
64 581 DATA 0,240,0,0,0,0,0,120
    ,360
D6 582 DATA 169,11,141,17,208,1
    69,53,133,901
24 583 DATA 1,160,0,169,0,133,2
    51,169,883
F7 584 DATA 12,133,252,177,251,
    141,24,212,1202
B4 585 DATA 162,0,232,224,5,208
    ,251,200,1282
26 586 DATA 208,241,230,252,165
    ,252,201,208,1757
36 587 DATA 208,233,76,165,241,
    0,0,169,1092
75 588 DATA 1,133,65,76,80,240,
    165,65,825
05 589 DATA 201,1,208,3,76,96,2
    40,201,1026
1C 590 DATA 2,240,3,76,165,241,
    76,32,835
EB 591 DATA 241,0,0,0,0,0,0,169
    ,410
6B 592 DATA 0,133,251,169,12,13
    3,252,169,1119
B4 593 DATA 2,133,65,169,5,133,
    1,120,628
61 594 DATA 169,11,141,17,208,1

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LISTINGS

69,176,162,1053	SE	153,688	7A	678 DATA 169,255,141,192,241
C7 595 DATA 0,141,6,220,142,7,2	5E 637 DATA 0,217,153,0,218,153	0,219,960	23	679 DATA 43,241,76,95,11,0,0
1F 596 DATA 13,220,169,25,141,1	C2 638 DATA 200,208,229,160,0,1	85,60,242,1284	B7	680 DATA 12,141,113,240,141,
9B 597 DATA 0,162,8,169,0,133,2	2F 639 DATA 201,255,240,12,153,	0,4,169,1034	FC	681 DATA 154,241,141,239,241
30 598 DATA 173,13,220,41,16,24	55 640 DATA 1,153,0,216,200,76,	38,242,926	6D	682 DATA 136,240,142,86,241,
AG 599 DATA 15,141,24,212,56,38	70 641 DATA 76,119,242,32,32,16	18,5,540	39	683 DATA 241,142,196,241,169
A0 600 DATA 208,237,165,2,145,2	80 642 DATA 19,19,32,19,16,1,3,	5,114	DS	684 DATA 241,169,0,141,43,24
3E 601 DATA 208,8,230,252,165,2	F1 643 DATA 32,20,15,32,19,20,1	18,157	88	685 DATA 9,0,0,0,0,0,160,1
3A 602 DATA 240,11,76,216,240,1	EC 644 DATA 20,32,19,1,13,16,12	5,118	C7	686 DATA 0,169,0,153,0,4,153
01 603 DATA 24,212,76,238,240,7	40 645 DATA 32,16,12,1,25,9,14,	7,116	37	687 DATA 5,153,0,6,153,0,7,1
ED 604 DATA 0,0,0,0,0,0,0,0,0	3D 646 DATA 32,255,0,165,65,201	0,208,926	BA	688 DATA 0,216,153,0,217,153
30 605 DATA 0,0,0,0,0,0,0,120,1	FD 647 DATA 3,76,211,10,201,1,2	08,3,713	B6	689 DATA 153,0,219,200,208,2
7E 606 DATA 169,11,141,17,208,1	67 648 DATA 76,5,242,76,160,243	32,240,1074	5E	690 DATA 185,60,242,201,255,
E0 607 DATA 1,169,0,133,251,169	75 649 DATA 242,234,234,234,234	120,169,11,1478	F1	691 DATA 0,4,169,1,153,0,216
0E 608 DATA 252,160,0,177,251,1	16 650 DATA 141,17,208,160,0,13	2,251,169,1078	5F	692 DATA 76,193,243,173,1,22
DB 609 DATA 8,165,2,10,133,2,17	B0 651 DATA 12,133,252,177,251,	141,24,212,1202	56	693 DATA 208,249,173,1,220,2
BA 610 DATA 169,0,141,24,212,23	3E 652 DATA 173,1,220,201,251,2	40,21,162,1269	1A	694 DATA 249,120,169,11,141,
1B 611 DATA 234,136,208,237,230	DB 653 DATA 0,232,224,5,208,251	200,208,1328	72	695 DATA 0,133,251,169,12,13
CE 612 DATA 230,252,165,252,201	53 654 DATA 234,230,252,165,252	201,208,208,1750	E8	696 DATA 0,177,251,133,2,173
73 613 DATA 76,50,241,234,234,2	97 655 DATA 226,76,211,10,165,2	51,141,119,1199	3D	697 DATA 201,251,240,45,160,
3C 614 DATA 15,141,24,212,76,70	DA 656 DATA 2,165,252,141,120,2	173,1,856	7F	698 DATA 10,133,2,176,25,169
8D 615 DATA 165,241,0,0,0,0,0,1	59 657 DATA 220,201,255,208,249	177,251,141,1702	0E	699 DATA 24,212,234,234,136,
20 616 DATA 169,11,141,17,208,1	50 658 DATA 24,212,173,1,220,20	1,239,240,1310	AB	700 DATA 251,208,8,230,252,1
D0 617 DATA 1,160,255,169,0,133	EA 659 DATA 18,162,0,232,224,5,	208,251,1100	F1	701 DATA 208,240,11,76,240,2
4A 618 DATA 207,133,252,177,251	3A 660 DATA 200,208,234,230,252	165,252,201,1742	B1	702 DATA 141,24,212,76,11,24
97 619 DATA 162,0,232,224,5,208	SA 661 DATA 208,208,226,165,251	141,121,2,1322	92	703 DATA 10,165,251,141,119,
CB 620 DATA 192,255,208,239,198	03 662 DATA 165,252,141,122,2,7	6,0,243,1001	FB	704 DATA 141,120,2,173,1,220
9A 621 DATA 201,12,208,231,76,2	D4 663 DATA 0,0,0,0,0,0,0,173,1	73	AB	705 DATA 208,249,160,0,177,2
F5 622 DATA 0,0,0,0,165,66,201,	D2 664 DATA 1,220,201,239,208,2	49,173,1,1292	3F	706 DATA 173,1,220,201,239,2
00 623 DATA 240,3,76,224,9,76,2	4F 665 DATA 220,201,255,208,249	96,0,173,1402	BC	707 DATA 8,165,2,10,133,2,17
E9 624 DATA 0,0,0,0,120,169,11,	5F 666 DATA 120,2,141,113,240,1	41,154,241,1152	12	708 DATA 169,0,141,24,212,76
0C 625 DATA 17,208,169,53,133,1	F7 667 DATA 174,122,2,142,136,2	40,202,142,1160	61	709 DATA 230,251,208,8,230,2
6D 626 DATA 133,251,169,207,133	2B 668 DATA 129,241,76,211,10,0	0,0,667	74	710 DATA 201,208,240,11,76,5
9A 627 DATA 177,251,133,2,160,8	AE 669 DATA 169,12,141,113,240,	141,47,241,1104	06	711 DATA 15,141,24,212,76,86
BE 628 DATA 74,133,2,176,31,169	47 670 DATA 141,154,241,141,239	241,162,208,1527	51	712 DATA 251,141,121,2,165,2
2D 629 DATA 24,212,234,234,234,	84 671 DATA 142,136,240,142,86,	241,202,142,1331	1D	713 DATA 2,76,136,244,76,122
74 630 DATA 198,251,234,165,251	89 672 DATA 129,241,142,196,241	169,255,141,1514	EA	714 DATA 136,208,198,76,89,2
AE 631 DATA 8,198,252,165,252,2	E5 673 DATA 192,241,169,0,141,4	3,241,76,1103	0E	715 DATA 119,2,141,43,241,17
26 632 DATA 14,76,199,241,234,2	SF 674 DATA 211,10,0,169,12,141	113,240,896	33	716 DATA 141,47,241,174,122,
1F 633 DATA 15,141,24,212,76,21	06 675 DATA 141,47,241,141,154,	241,141,239,1345	F1	717 DATA 2,201,128,176,6,142
8B 634 DATA 211,10,234,96,160,0	CB 676 DATA 241,162,208,142,136	240,142,86,1357	17	718 DATA 76,168,244,202,142,
08 635 DATA 153,0,4,153,0,5,153	BA 677 DATA 241,202,142,129,241	142,196,241,1534	7B	719 DATA 121,2,141,192,241,1
50 636 DATA 6,153,0,7,153,0,216				73,122,2,994

LISTINGS

97	720 DATA 141,196,241,173,120,2,141,239,1253	D1	2,32,256	EC	32,149
31	721 DATA 241,76,211,10,0,0,0,165,703	9C	761 DATA 32,32,32,32,32,3,2,32,256	75	804 DATA 19,21,18,5,32,25,15,21,156
1E	722 DATA 65,201,1,240,3,76,2,11,10,807	95	762 DATA 32,1,32,19,32,4,32,6,158	51	805 DATA 32,23,9,19,8,32,20,15,158
78	723 DATA 173,113,240,141,255,255,173,136,1486	11	763 DATA 32,7,32,8,32,10,32,11,164	A6	806 DATA 32,5,18,1,19,5,32,19,131
29	724 DATA 240,141,255,255,0,0,0,0,891	3D	764 DATA 32,12,32,58,32,32,3,2,32,262	81	807 DATA 1,13,16,12,5,32,32,32,143
68	725 DATA 0,0,0,0,0,0,0,120,120	F0	765 DATA 32,32,32,32,32,3,2,32,256	84	808 DATA 32,32,32,32,32,3,2,32,256
A2	726 DATA 169,11,141,17,208,160,0,169,875	FB	766 DATA 32,32,32,32,32,3,2,32,256	SF	809 DATA 32,32,32,32,32,3,2,32,256
76	727 DATA 0,133,251,173,113,240,133,252,1295	39	767 DATA 77,32,32,32,32,3,2,32,301	02	810 DATA 32,32,32,32,32,3,2,32,256
29	728 DATA 177,251,141,24,212,162,0,232,1199	34	768 DATA 32,32,32,32,32,3,2,32,256	6D	811 DATA 32,32,32,32,32,3,2,32,256
B7	729 DATA 224,5,208,251,234,234,200,208,1564	D7	769 DATA 32,32,32,32,78,32,3,2,32,302	A0	812 DATA 32,32,32,32,32,3,2,32,256
D9	730 DATA 239,230,252,165,252,205,136,240,1719	3A	770 DATA 32,32,32,32,32,3,2,32,256	95	813 DATA 32,32,32,32,32,3,2,32,256
A9	731 DATA 208,230,76,11,245,0,0,120,890	C7	771 DATA 32,32,32,32,32,3,2,32,256	D3	814 DATA 32,32,32,32,32,3,2,25,249
CC	732 DATA 169,11,141,17,208,160,0,169,875	5A	772 DATA 32,32,32,32,32,2,55,0,447	7A	815 DATA 47,14,255,0,0,0,0,160,476
18	733 DATA 0,133,251,173,113,240,133,252,1295	CD	773 DATA 0,0,0,0,0,80,0,141,221	32	816 DATA 0,169,0,133,251,169,12,133,867
47	734 DATA 177,251,141,24,212,162,0,232,1199	21	774 DATA 94,246,160,0,185,149,246,205,1285	23	817 DATA 252,169,0,145,251,200,208,251,1476
D4	735 DATA 224,1,208,251,200,208,241,230,1563	FS	775 DATA 94,246,240,8,200,192,21,208,1209	0D	818 DATA 230,252,165,252,201,208,208,241,1757
E5	736 DATA 252,165,252,205,136,240,208,232,1690	3F	776 DATA 243,76,116,11,192,10,176,12,836	AS	819 DATA 169,0,133,65,76,211,10,0,664
BB	737 DATA 96,0,0,0,0,0,0,160,256	DA	777 DATA 185,181,246,141,42,245,32,16,1088	9F	820 DATA 0,0,0,0,160,0,169,0,329
19	738 DATA 0,169,1,153,0,216,185,88,812	40	778 DATA 245,76,116,11,185,181,246,141,1201	B3	821 DATA 153,0,4,153,0,5,153,0,468
45	739 DATA 245,201,255,240,7,153,0,4,1105	FC	779 DATA 253,246,32,16,247,76,116,11,997	69	822 DATA 6,153,0,7,153,0,216,153,688
EB	740 DATA 200,76,66,245,76,116,11,32,822	CE	780 DATA 0,0,0,0,81,87,69,82,319	7C	823 DATA 0,217,153,0,218,153,0,219,960
ES	741 DATA 32,32,32,32,32,3,2,32,256	1E	781 DATA 84,89,85,73,79,80,65,83,638	5B	824 DATA 200,208,227,76,48,247,0,0,1006
DA	742 DATA 32,32,21,19,5,32,20,8,169	61	782 DATA 68,70,71,72,74,75,76,58,564	27	825 DATA 0,0,0,0,0,0,0,169,169
59	743 DATA 5,19,5,32,11,5,25,19,121	AB	783 DATA 0,0,0,0,0,0,0,0,0	BE	826 DATA 0,133,251,160,0,169,1,153,867
2B	744 DATA 46,46,46,32,32,32,3,2,32,298	D3	784 DATA 0,0,0,0,10,9,8,7,34	8E	827 DATA 0,216,153,0,217,153,0,218,957
41	745 DATA 32,32,32,32,32,3,2,32,256	25	785 DATA 6,5,4,3,2,1,10,9,40	B3	828 DATA 153,0,219,200,208,241,165,251,1437
44	746 DATA 32,32,32,32,32,3,2,32,256	24	786 DATA 8,7,6,5,4,3,2,1,36	43	829 DATA 201,0,208,3,76,49,248,201,986
25	747 DATA 78,32,32,32,32,3,2,32,302	CF	787 DATA 0,0,0,0,0,0,0,0,0	35	830 DATA 1,208,3,76,91,248,201,2,830
C2	748 DATA 32,32,32,32,32,3,2,32,256	E5	788 DATA 0,0,0,0,0,0,0,0,0	59	831 DATA 208,3,76,133,248,76,175,248,1167
8D	749 DATA 32,32,32,32,77,32,3,2,32,301	11	789 DATA 0,0,0,0,0,0,0,120,120	A9	832 DATA 169,52,133,1,160,0,185,0,700
60	750 DATA 32,32,32,32,32,3,2,32,256	75	790 DATA 169,11,141,17,208,169,53,133,901	5A	833 DATA 208,153,0,4,185,0,209,153,912
5B	751 DATA 32,32,32,32,32,3,2,32,256	20	791 DATA 1,160,255,169,0,133,251,169,1138	D0	834 DATA 0,5,185,0,210,153,0,6,559
25	752 DATA 32,17,32,23,32,5,32,18,191	D3	792 DATA 207,133,252,177,251,141,24,212,1397	56	835 DATA 185,0,211,153,0,7,200,208,964
C0	753 DATA 32,20,32,25,32,21,3,2,9,203	DC	793 DATA 162,0,232,224,10,208,251,136,1223	SF	836 DATA 229,169,53,133,1,230,251,76,1142
25	754 DATA 32,15,32,16,32,32,3,2,32,223	C1	794 DATA 192,255,208,239,198,252,165,252,1761	26	837 DATA 202,11,169,52,133,1,160,0,728
07	755 DATA 32,32,32,32,32,3,2,32,256	B2	795 DATA 201,128,208,231,96,0,0,173,1037	DB	838 DATA 185,0,212,153,0,4,185,0,739
2A	756 DATA 32,32,32,32,32,3,2,32,256	0F	796 DATA 125,241,141,237,246,173,129,241,1533	8D	839 DATA 213,153,0,5,185,0,214,153,923
FS	757 DATA 32,32,32,32,32,3,2,32,256	5D	797 DATA 141,241,246,173,154,241,141,10,1347	E7	840 DATA 0,6,185,0,215,153,0,7,566
28	758 DATA 32,32,32,32,32,3,2,32,256	C8	798 DATA 247,76,224,246,0,0,0,0,793	7F	841 DATA 200,208,229,169,53,133,1,230,1223
23	759 DATA 32,32,32,32,32,3,2,32,256	06	799 DATA 0,0,0,0,0,0,0,160,160	7E	842 DATA 251,76,202,11,169,52,133,1,895
56	760 DATA 32,32,32,32,32,3,2,32,256	A9	800 DATA 0,185,72,247,201,255,240,12,1212	10	843 DATA 160,0,185,0,216,153,0,4,718
		6E	801 DATA 153,0,4,169,1,153,0,216,696	B6	844 DATA 185,0,217,153,0,5,1
			802 DATA 200,76,50,247,76,164,11,32,856		
			803 DATA 1,18,5,32,25,15,21,		

LISTINGS

85,0,745
FA 845 DATA 218,153,0,6,185,0,2
19,153,934
02 846 DATA 0,7,200,208,229,169
53,133,999
DS 847 DATA 1,230,251,76,202,11
169,52,992
SS 848 DATA 133,1,160,0,185,0,2
20,153,852
CS 849 DATA 0,4,185,0,221,153,0
5,568
7C 850 DATA 185,0,222,153,0,6,1
85,0,751
C0 851 DATA 223,153,0,7,200,208
229,169,1189
7B 852 DATA 53,133,1,230,251,76
233,11,988
2B 853 DATA 0,0,0,0,0,0,0,0,0
2A 854 DATA 0,0,0,0,0,0,0,0,0
29 855 DATA 0,0,0,0,0,0,0,0,0
2B 856 DATA 0,0,0,0,0,0,0,0,0
EF 857 DATA 0,0,0,0,0,0,0,0,0
EE 858 DATA 0,0,0,0,0,0,0,0,0
ED 859 DATA 0,0,0,0,0,0,0,0,0
EC 860 DATA 0,0,0,0,0,0,0,0,0
0B 861 DATA 0,0,0,0,0,0,0,28,28

61 862 DATA 8,10,0,158,50,57,48
51,382
9D 863 DATA 32,169,72,69,78,32,
84,72,608
C6 864 DATA 79,77,32,40,67,41,3
9,56,431
32 865 DATA 56,0,0,0,0,0,169,14
7,372
5A 866 DATA 32,176,8,169,11,141
17,208,762
44 867 DATA 160,0,185,0,224,153
0,4,726
0E 868 DATA 185,0,225,153,0,5,1
85,0,753
52 869 DATA 226,153,0,6,185,0,2
27,153,950
11 870 DATA 0,7,185,0,228,153,0
216,789
D1 871 DATA 185,0,229,153,0,217
185,0,969
C9 872 DATA 230,153,0,218,185,0
231,153,1170
18 873 DATA 0,219,200,208,205,1
69,0,32,1033
F5 874 DATA 60,9,234,234,234,16
9,27,141,1108
76 875 DATA 17,208,32,228,255,2
01,0,240,1181
2C 876 DATA 249,201,49,144,245,
201,55,176,1320
1E 877 DATA 241,56,233,48,133,2
51,201,6,1169
3F 878 DATA 208,3,76,102,254,16
4,251,185,1243
97 879 DATA 159,8,133,252,185,1
67,8,133,1045
22 880 DATA 253,108,252,0,141,3
2,208,169,1163
28 881 DATA 55,133,1,88,96,0,19
2,249,814
93 882 DATA 216,241,80,0,0,0,8,
9,554
83 883 DATA 9,9,9,0,0,0,32,210,
269
CA 884 DATA 255,120,169,53,133,
1,96,169,996
33 885 DATA 55,133,1,88,96,0,16
9,147,689
36 886 DATA 32,210,255,169,207,
160,8,32,1073
FB 887 DATA 30,171,76,240,8,73,
78,83,759
88 888 DATA 69,82,84,32,84,65,8
0,69,565
81 889 DATA 32,38,32,80,82,69,8
3,83,499
96 890 DATA 32,82,69,84,85,82,7

8,0,512
64 891 DATA 0,0,0,0,0,0,32,228,
260
40 892 DATA 255,201,13,240,7,16
9,55,133,1073
80 893 DATA 1,76,240,8,169,7,13
3,1,635
C1 894 DATA 120,169,11,141,17,2
08,173,13,852
EB 895 DATA 220,169,25,141,15,2
20,173,13,976
F9 896 DATA 220,41,16,240,8,169
15,141,850
1A 897 DATA 24,212,76,36,9,169,
0,141,667
3C 898 DATA 24,212,173,1,220,20
1,255,240,1326
44 899 DATA 229,169,63,133,0,16
9,55,133,951
FD 900 DATA 1,169,27,141,17,208
88,76,727
B4 901 DATA 32,8,141,32,208,141
33,208,803
1E 902 DATA 169,55,133,1,88,96,
0,0,542
81 903 DATA 0,0,0,0,0,0,169,147
316
82 904 DATA 32,210,255,169,11,1
41,17,208,1043
D8 905 DATA 120,169,53,133,1,16
0,0,185,821
7F 906 DATA 0,232,153,0,4,185,0
233,807
DD 907 DATA 153,0,5,185,0,234,1
53,0,730
67 908 DATA 6,185,0,235,153,0,7
185,771
A0 909 DATA 0,236,153,0,216,185
0,237,1027
1C 910 DATA 153,0,217,185,0,238
153,0,946
4D 911 DATA 218,185,0,239,153,0
219,200,1214
A2 912 DATA 208,205,169,55,133,
1,88,169,1028
F9 913 DATA 27,141,17,208,32,22
8,255,201,1109
05 914 DATA 0,240,249,201,49,14
4,245,201,1329
34 915 DATA 56,176,241,56,233,4
8,133,251,1194
88 916 DATA 201,7,208,3,76,32,8
164,699
DE 917 DATA 251,185,199,9,133,2
52,185,207,1421
37 918 DATA 9,133,253,108,252,0
118,8,881
3D 919 DATA 144,248,194,156,0,0
10,10,762
60 920 DATA 11,10,11,11,0,0,120
169,332
64 921 DATA 53,133,1,76,144,240
169,63,879
7F 922 DATA 133,0,169,55,133,1,
169,11,671
C1 923 DATA 141,17,208,88,76,32
8,120,690
87 924 DATA 169,53,133,1,76,151
240,120,943
8D 925 DATA 169,53,133,1,76,176
240,169,1017
5D 926 DATA 0,133,65,76,32,8,16
9,147,630
99 927 DATA 32,210,255,169,23,1
60,10,32,891
54 928 DATA 30,171,76,43,10,67,
85,82,564
D3 929 DATA 82,69,78,84,32,83,8
0,69,577
ED 930 DATA 69,68,32,73,83,32,0
0,357
15 931 DATA 0,120,169,53,133,1,
174,125,775
BA 932 DATA 240,169,55,133,1,88

,169,0,855
F7 933 DATA 32,205,189,32,228,2
55,201,0,1142
14 934 DATA 240,249,201,3,208,3
76,80,1060
B2 935 DATA 9,201,43,240,7,201,
45,240,986
8E 936 DATA 19,76,61,10,120,169
53,133,641
6A 937 DATA 1,238,125,240,169,5
5,133,1,962
E4 938 DATA 88,76,8,10,120,169,
53,133,657
BC 939 DATA 1,206,125,240,169,5
5,133,1,930
C7 940 DATA 88,76,8,10,169,147,
32,210,740
BE 941 DATA 255,169,133,160,10,
32,30,171,960
63 942 DATA 76,164,10,80,76,65,
89,32,592
B1 943 DATA 83,65,77,80,76,69,3
2,82,564
7D 944 DATA 69,86,69,82,83,69,3
2,79,569
D6 945 DATA 82,32,70,79,82,87,6
5,82,579
2B 946 DATA 68,0,32,228,255,201
0,240,1024
56 947 DATA 249,201,82,240,7,20
1,70,208,1258
5A 948 DATA 241,76,232,10,165,6
5,201,0,990
5F 949 DATA 208,3,76,80,9,201,2
240,819
77 950 DATA 8,120,169,53,133,1,
76,239,799
36 951 DATA 10,120,169,53,133,1
76,181,743
A4 952 DATA 241,169,63,133,0,16
9,55,133,963
DC 953 DATA 1,169,11,141,17,208
88,169,804
8E 954 DATA 0,133,66,76,80,9,16
9,1,534
0B 955 DATA 133,66,76,241,9,173
125,240,1063
30 956 DATA 141,141,241,76,112,
241,169,147,1268
FB 957 DATA 32,210,255,169,7,16
0,11,32,876
01 958 DATA 30,171,76,49,11,83,
69,76,565
B2 959 DATA 69,67,84,13,13,49,3
2,45,372
D9 960 DATA 32,82,69,83,84,79,8
2,69,580
CA 961 DATA 32,84,79,32,68,69,7
0,65,499
F9 962 DATA 85,76,84,13,13,50,3
2,45,398
A4 963 DATA 32,67,82,79,80,0,0,
32,372
52 964 DATA 228,255,201,0,240,2
49,201,3,1377
58 965 DATA 208,3,76,80,9,201,4
9,240,866
8F 966 DATA 12,201,50,208,234,1
20,169,53,1047
3F 967 DATA 133,1,76,100,242,12
0,169,53,894
1A 968 DATA 133,1,76,25,243,120
169,53,820
45 969 DATA 133,1,76,68,243,169
55,133,878
86 970 DATA 1,88,76,1,10,169,14
7,32,524
F1 971 DATA 210,255,120,169,53,
133,1,76,1017
A4 972 DATA 64,245,169,55,133,1
88,32,787
7B 973 DATA 228,255,201,0,240,2
49,201,3,1377
5A 974 DATA 208,3,76,211,10,120


```
,162,53,843
FD 975 DATA 134,1,76,96,246,0,1
65,65,783
4B 976 DATA 201,1,208,3,76,103,
11,76,679
7B 977 DATA 211,10,120,169,53,1
33,1,76,773
8E 978 DATA 213,247,169,55,133,
1,88,32,938
AA 979 DATA 228,255,201,78,208,
3,76,211,1260
10 980 DATA 10,201,89,240,3,76,
169,11,799
09 981 DATA 120,169,53,133,1,76
176,247,975
CC 982 DATA 120,169,53,133,1,76
0,248,800
EA 983 DATA 169,55,133,1,88,32,
228,255,961
7B 984 DATA 201,0,240,249,201,3
208,3,1105
DS 985 DATA 76,211,10,201,32,20
8,238,120,1096
EF 986 DATA 169,53,133,1,76,23,
248,169,872
4B 987 DATA 55,133,1,88,32,228,
255,201,993
8B 988 DATA 32,208,249,76,211,1
0,0,0,786
15 989 DATA 0,0,0,0,0,0,0,199,1
99
E0 990 DATA -1
```

SET THE ALARM



PROGRAM: ALARM

```
3B 1 :
D6 2 REM      ALARM - BASIC LO
ADER
9E 3 REM      N.P. GREGORY 0
986
3E 4 :
F0 5 REM SYS 49152 : TURN OFF
24 6 REM SYS 49152,"A/PHMM","A
/PHMM","STRING",1 - DISPLAY
CLOCK
3D 7 :
86 10 RESTORE
BF 12 ADRES = 49152
69 14 LINE = 100
99 16 ELINE = 370
DB 18 C=0:T=0
2E 20 :
42 22 FOR LN = LINE TO ELINE ST
EP 5
07 24 FOR A=0 TO 9
35 26 READ DT:IF DT=-1 THEN A=9
:GOTO 30
F0 28 POKE ADRES+C,DT:T=T+DT:C=C
+1:NEXT A
CE 30 READ CH:IF CH<>T THEN PRI
NT"ERROR IN LINE":LN:END
OC 32 T=0:NEXT LN
B4 100 DATA 169,0,141,7,194,173
,13,220,9,4,930
A6 105 DATA 41,127,141,13,220,3
2,121,0,208,13,916
C0 110 DATA 120,169,49,141,20,3
,169,234,141,21,1067
41 115 DATA 3,88,96,32,254,192,
165,180,141,3,1154
F1 120 DATA 194,165,181,141,4,1
```

```
94,32,254,192,165,1522
78 125 DATA 180,141,5,194,165,1
81,141,6,194,32,1239
D9 130 DATA 253,174,32,158,173,
32,163,182,201,27,1395
15 135 DATA 144,3,76,67,193,72,
173,136,2,141,1007
25 140 DATA 98,192,141,128,192,
141,141,192,56,32,1313
81 145 DATA 240,255,134,180,132
,181,173,0,4,133,1432
E1 150 DATA 182,104,168,169,0,1
53,12,194,169,160,1311
F6 155 DATA 153,11,194,136,132,
183,32,102,229,164,1336
8E 160 DATA 183,177,34,32,71,17
1,173,0,4,9,854
30 165 DATA 128,153,11,194,136,
16,233,165,182,141,1359
70 170 DATA 0,4,24,166,180,164,
181,32,240,255,1246
96 175 DATA 32,121,0,240,14,32,
253,174,32,158,1056
43 180 DATA 183,224,2,144,3,76,
67,193,138,74,1104
B0 185 DATA 106,141,7,194,173,1
4,220,9,128,141,1133
E5 190 DATA 14,220,173,15,220,9
,128,141,15,220,1155
4A 195 DATA 174,5,194,142,11,22
0,174,6,194,142,1262
F5 200 DATA 10,220,160,0,140,9,
220,140,8,220,1127
74 205 DATA 41,127,141,15,220,1
73,3,194,141,11,1066
3D 210 DATA 220,173,4,194,141,1
0,220,140,9,220,1331
6F 215 DATA 140,8,220,120,169,8
7,141,20,3,169,1077
87 220 DATA 193,141,21,3,173,13
,220,9,132,141,1046
7B 225 DATA 13,220,88,96,32,253
,174,32,158,173,1239
12 230 DATA 32,163,182,201,5,24
0,3,76,8,175,1085
2A 235 DATA 160,0,177,34,201,65
,240,4,201,80,1162
A7 240 DATA 208,241,132,180,201
,80,208,4,169,128,1551
20 245 DATA 133,180,169,19,133,
182,32,43,193,200,1284
28 250 DATA 177,34,41,15,10,10,
10,10,133,181,621
74 255 DATA 200,177,34,41,15,5,
181,133,181,197,1164
1A 260 DATA 182,144,5,162,14,76
,55,164,166,182,1150
32 265 DATA 224,19,208,4,5,180,
133,180,169,96,1218
33 270 DATA 133,182,96,173,7,19
4,16,56,72,173,1102
C0 275 DATA 136,2,141,123,193,1
41,223,193,141,250,1543
6F 280 DATA 193,160,28,162,1,17
3,11,220,16,2,966
D1 285 DATA 162,16,133,2,138,9,
128,153,0,4,745
24 290 DATA 165,2,41,127,170,32
,218,193,174,10,1132
8D 295 DATA 220,32,218,193,174,
9,220,32,218,193,1509
3B 300 DATA 173,8,220,104,41,12
7,208,9,173,13,1076
D0 305 DATA 220,16,58,41,4,240,
54,160,0,174,967
D2 310 DATA 136,2,142,179,193,1
85,10,194,240,15,1296
1D 315 DATA 77,9,194,153,0,4,17
3,134,2,153,899
OB 320 DATA 0,216,200,208,236,1
73,7,194,9,1,1244
O2 325 DATA 141,7,194,206,8,194
,208,13,169,20,1160
16 330 DATA 141,8,194,173,9,194
```

```
,73,128,141,9,1070
0A 335 DATA 194,76,49,234,169,1
74,200,153,0,4,1253
65 340 DATA 173,134,2,153,0,216
,138,41,240,74,1171
84 345 DATA 74,74,74,32,240,193
,41,15,24,105,872
2A 350 DATA 48,9,128,200,153,0,
4,173,134,2,851
3D 355 DATA 153,0,216,138,96,0,
0,0,0,0,603
8D 360 DATA 20,128,160,0,0,0,0,
0,0,0,308
55 365 DATA 0,0,0,0,0,0,0,0,0,0
,0
4E 370 DATA 0,0,0,0,0,0,0,0,0,-
1,0
```

JACK IN THE BOX



PROGRAM: BOXES LOADER

```
OB 5 PRINT"CREATING PROGRAM : [
RVSON]BOX UTILS{RVSOFF,DOWN2
}"
AB 10 BL=47:LN=50:SA=52480
5B 20 FOR L=0 TO BL:CX=0:FOR D=
0 TO 15:READ A:CX=CX+A:POKE
SA+L*16+D,A:NEXT D
03 30 READ A:PRINT":IF A<CX
THENPRINT"ERROR IN LINE":LN
+(L*10):STOP
86 40 NEXT L
B9 50 DATA 32,155,183,142,32,20
8,32,155,183,142,33,208,32,1
55,183,142,2017
B3 60 DATA 134,2,32,155,183,142
,104,207,32,155,183,142,105,
207,32,155,1970
C9 70 DATA 183,142,106,207,96,3
2,155,183,142,95,207,32,155,
183,142,96,2156
5E 80 DATA 207,32,155,183,142,9
7,207,32,155,183,142,98,207,
32,155,183,2210
C5 90 DATA 142,99,207,32,155,18
3,142,100,207,32,155,183,142
,101,207,169,2256
00 100 DATA 146,32,210,255,32,1
55,183,224,1,208,5,169,18,32
,210,255,2135
0E 110 DATA 234,174,134,2,142,1
02,207,174,101,207,142,134,2
,169,32,174,2130
95 120 DATA 97,207,172,95,207,3
2,51,206,200,204,96,207,208,
247,232,236,2697
10 130 DATA 98,207,208,238,169,
176,172,95,207,174,97,207,32
,51,206,169,2506
D8 140 DATA 189,172,96,207,174,
98,207,32,51,206,169,173,172
,95,207,174,2422
37 150 DATA 98,207,32,51,206,16
9,174,172,96,207,174,97,207,
32,51,206,2179
62 160 DATA 172,95,207,200,169,
195,174,97,207,32,51,206,174
,98,207,32,2316
58 170 DATA 51,206,174,99,207,2
40,6,174,99,207,32,51,206,17
4,100,207,2233
30 180 DATA 240,3,32,51,206,200
```


LISTINGS

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,204.96,207.208,219,172,95,2
07,174,97,2411
B9 190 DATA 207,232,169,221,172
,95,207,32,51,206,172,96,207
,32,51,206,2356
99 200 DATA 232,236,98,207,208,
238,173,99,207,240,19,169,17
1,172,95,207,2771
F3 210 DATA 174,99,207,32,51,20
6,169,179,172,96,207,32,51,2
06,173,100,2154
26 220 DATA 207,240,19,169,171,
172,95,207,174,100,207,32,51
,206,169,179,2398
C5 230 DATA 172,96,207,32,51,20
6,234,169,19,32,210,255,174,
102,207,142,2308
D4 240 DATA 134,2,96,72,24,32,2
40,255,104,32,210,255,96,32,
155,183,1922
71 250 DATA 142,95,207,32,155,1
83,172,95,207,24,32,240,255,
96,32,155,2122
E6 260 DATA 183,142,94,207,32,1
55,183,173,94,207,232,142,89
,207,141,90,2371
65 270 DATA 207,174,134,2,142,1
01,207,169,0,141,91,207,160,
24,169,0,1928
7C 280 DATA 153,64,207,136,16,2
48,32,34,207,32,228,255,240,
251,141,92,2336
3C 290 DATA 207,201,20,208,41,1
73,91,207,201,0,240,237,206,
91,207,172,2502
9B 300 DATA 91,207,169,0,153,64
,207,32,58,207,169,32,32,210
,255,32,1918
AE 310 DATA 58,207,32,58,207,32
,34,207,32,58,207,76,19,207,
173,91,1698
BD 320 DATA 207,24,105,1,205,89
,207,208,14,173,92,207,201,1
3,240,7,1993
BO 330 DATA 201,20,240,3,76,121
,206,173,92,207,201,13,208,1
5,32,58,1866
C1 340 DATA 207,169,32,32,210,2
55,174,101,207,142,134,2,96,
24,173,90,2048
09 350 DATA 207,201,1,240,17,17
3,92,207,201,32,144,141,173,
92,207,201,2329
8C 360 DATA 157,176,44,76,1,207
,173,92,207,201,48,144,34,20
1,58,176,1995
4E 370 DATA 30,32,58,207,173,92
,207,32,210,255,172,91,207,1
53,64,207,2190
82 380 DATA 238,91,207,173,91,2
07,205,89,207,208,1,96,76,11
8,206,76,2289
46 390 DATA 121,206,169,154,32,
210,255,174,105,207,142,134,
2,173,106,207,2397
22 400 DATA 32,210,255,174,104,
207,142,134,2,96,169,157,32,
210,255,96,2275
C8 410 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0
36 420 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3C 430 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2A 440 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0
10 450 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1E 460 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0
04 470 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0
72 480 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0

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F0 490 DATA 0,205,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,205
66 500 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0
6C 510 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0
59 520 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0
05 530 PRINT "[DOWN2]PRESS ANY
KEY TO SAVE MACHINE CODE"
D6 540 GETK$:IFK$=""THEN 540
5B 550 POKE43,0:POKE44,205:POKE
45,0:POKE46,208:CLR:SAVE"BOX
UTILS",8
24 560 REM ** CHANGE ,8 TO ,1 I
F USING CASSETTE **

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PROGRAM: BOX DEMO

```

D1 1000 :
FC 1010 F=F+1
50 1020 IFF-1THENLOAD"BOX UTILS
",8,1
48 1030 PRINT"[CLR]"
D2 1040 CO=52480 : REM CONFIG
05 1050 BO=52517 : REM BOX
12 1060 AT=52797 : REM PRINT AT
1C 1070 IN=52814 : REM INPUT RO
UTINE
06 1080 :
56 1090 GOTO1150
6A 1100 :
AB 1110 SYSAT,9,24:PRINT"[RVSOFF
F,C7]PRESS A KEY TO CONTINUE
";
4D 1120 GETA$:IFA$=""THEN1120
E0 1130 RETURN
42 1140 :
10 1150 SYSCO,6,6,1,4,7,ASC("[C
P]")
27 1160 SYSBO,5,35,4,8,0,0,1,0
A1 1170 SYSAT,12,6:PRINT"[C7]WE
LCOME TO BOXES"
90 1180 GOSUB1110
E8 1190 PRINT"[CLR]"
16 1200 SYSBO,0,39,0,23,0,0,14,
1
4B 1210 SYSAT,3,5
45 1220 PRINT"[C7]BOXES PROVIDE
S THE BASIC PROGRAMMER"
A7 1230 PRINT"[RVSON,RIGHT3]WIT
H SEVERAL FUNCTIONS:"
45 1240 PRINT
22 1250 PRINT"[RIGHT3,RVSON]CON
FIG"
F7 1260 PRINT"[RIGHT3,RVSON]AT"
3F 1270 PRINT"[RIGHT3,RVSON]DRA
W BOX"
CF 1280 PRINT"[RIGHT3,RVSON]INP
UT"
83 1290 GOSUB1110
53 1300 PRINT"[CLR]"
00 1310 SYSBO,0,39,0,10,0,0,14,
0
18 1320 SYSAT,1,1
14 1330 PRINT"[RIGHT,WHITE]AT.[
C7] THIS ALLOWS THE CURSOR T
O BE"
BF 1340 PRINT"[RIGHT6]PLACED ON
THE SCREEN"
09 1350 PRINT"[RIGHT3,DOWN,RIGH
T3]USING COORDINATES X,Y"
83 1360 PRINT"[RIGHT6]THIS IS U
SEFUL IF YOU REQUIRE"
F4 1370 PRINT"[RIGHT6]EXTENSIVE
CURSOR MOVEMENT"
65 1380 GOSUB1110
71 1390 PRINT"[CLR]"

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89 1400 SYSBO,0,39,0,20,0,0,14,
0
A3 1410 PRINT"[HOME,DOWN,RIGHT,
WHITE]BOX DRAW[C7] THIS ALLO
WS DISPLAY OF BOXES"
3D 1420 SYSAT,1,2:PRINT"ON THE
COMMODORE SCREEN"
90 1430 SYSAT,1,4:PRINT"CARE SH
OULD BE TAKEN NOT TO USE THE
"
9D 1440 SYSAT,1,5:PRINT"BOTTOM
RIGHT CHARACTER ON THE SCREE
N"
9D 1450 SYSAT,1,7:PRINT"BOXES C
AN BY DRAWN BE SPECIFYING"
B7 1460 SYSAT,1,9:PRINT"START X
,END X,START Y,END Y"
62 1470 SYSAT,1,10:PRINT"NEXT,
2 VERTICAL BARS MAY BE PLACE
D ON"
95 1480 SYSAT,1,11:PRINT"THESE
ARE SHOWN IN B1 AND B2"
4E 1490 SYSAT,1,12:PRINT"THE NE
XT PARAMETER, C1 IS THE COLO
R"
DB 1500 PRINT"[RIGHT]FINALLY, T
HE LAST FLAG IS SET"
8C 1510 PRINT"[RIGHT]1 INDICATE
S A REVERSE BOX"
CC 1520 PRINT"[RIGHT]ANY OTHER
INDICATES A NORMAL FRAME"
F3 1530 GOSUB1110
EE 1540 PRINT"[CLR]HERE ARE THE
TWO TYPES OF BOXES"
7D 1550 SYSBO,5,35,5,10,0,0,14,
0
6D 1560 SYSBO,5,35,11,16,0,0,14
,1
31 1570 SYSAT,6,6:PRINT"[RVSOFF
]NORMAL"
11 1580 SYSAT,6,12:PRINT"[RVSON
]REVERSE"
34 1590 GOSUB1110
B4 1600 PRINT"[CLR]"
4C 1610 SYSBO,1,19,0,3,0,0,1,0
DF 1620 SYSBO,20,38,0,3,0,0,2,0
02 1630 SYSBO,1,19,4,7,0,0,3,0
9D 1640 SYSBO,20,38,4,7,0,0,4,0
AD 1650 SYSBO,1,19,8,11,0,0,5,0
DE 1660 SYSBO,20,38,8,11,0,0,6,
0
8A 1670 SYSBO,1,19,12,15,0,0,7,
0
0B 1680 SYSBO,20,38,12,15,0,0,8
,0
90 1690 SYSBO,1,19,16,19,0,0,9,
0
BE 1700 SYSBO,20,38,16,19,0,0,1
0,0
69 1710 SYSBO,1,19,20,23,0,0,11
,0
6A 1720 SYSBO,20,38,20,23,0,0,1
2,0
48 1730 GOSUB1110
20 1740 PRINT"[CLR]"
19 1750 SYSBO,1,19,0,3,0,0,1,1
02 1760 SYSBO,20,38,0,3,0,0,2,1
OF 1770 SYSBO,1,19,4,7,0,0,3,1
28 1780 SYSBO,20,38,4,7,0,0,4,1
00 1790 SYSBO,1,19,8,11,0,0,5,1
40 1800 SYSBO,20,38,8,11,0,0,6,
1
90 1810 SYSBO,1,19,12,15,0,0,7,
1
BB 1820 SYSBO,20,38,12,15,0,0,8
,1
9E 1830 SYSBO,1,19,16,19,0,0,9,
1

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E0 1840 SYSBO,20,38,16,19,0,0,1
    0,1
A7 1850 SYSBO,1,19,20,23,0,0,11
    ,1
36 1860 SYSBO,20,38,20,23,0,0,1
    2,1
59 1870 GOSUB1110
9D 1880 PRINT"[CLR]"
A3 1890 SYSAT,15,0:PRINT"DATA I
    NPUT"
A0 1900 PRINT"[DOWN2,RIGHT]PLEA
    SE ENTER A WORD:"
0B 1910 SYSIN,0,10
58 1920 A$=""
F3 1930 FORL=0TO9
9D 1940 A$=A$+CHR$(PEEK(53056+L
    ))
73 1950 NEXTL
C0 1960 B$=A$
F6 1970 PRINT"[DOWN2]PLEASE ENT
    ER A NUMBER:"
90 1980 SYSIN,1,10
06 1990 A$=""
89 2000 FORL=0TO9:A$=A$+CHR$(PE
    EK(53056+L)):NEXTL
5D 2010 SYSAT,0,10
FE 2020 PRINT"[C7]WORD TYPED :
    [WHITE]";B$
DC 2030 PRINT"[C7]NUMBER TYPED
    : [WHITE]";VAL(A$)
F3 2040 GOSUB1110
48 2050 PRINT"[CLR]"
8Q 2060 OPT=1
FA 2070 SYSBO,8,34,1,5,0,0,1,1
EE 2080 SYSAT,16,2:PRINT"[WHITE
    ]BOX MENU"
BA 2090 SYSAT,10,3:PRINT"[RVSON
    ]USE CURSORS UP AND DOWN"
B7 2100 SYSAT,12,4:PRINT"[RVSON
    ]RETURN TO FINISH"
45 2110 SYSBO,10,30,10,12,0,0,1
    ,1
3D 2120 SYSBO,10,30,13,15,0,0,1
    4,1
8D 2130 SYSBO,10,30,16,18,0,0,1
    4,1
34 2140 SYSBO,10,30,19,21,0,0,1
    4,1
A5 2150 GETA$:IFA$=""THEN2150
85 2160 IFA$=CHR$(13)THENGOTO23
    00
E9 2170 IFA$="[DOWN]"ANDOPT=4TH
    ENOPT=1:GOTO2190
3F 2180 IFA$="[DOWN]"THENOPT=OP
    T+1
F6 2190 IFA$="[UP]"ANDOPT=1THEN
    OPT=4:GOTO2210
5A 2200 IFA$="[UP]"THENOPT=OPT-
    1
9D 2210 SYSBO,10,30,10,12,0,0,1
    4,1
11 2220 SYSBO,10,30,13,15,0,0,1
    4,1
89 2230 SYSBO,10,30,16,18,0,0,1
    4,1
B0 2240 SYSBO,10,30,19,21,0,0,1
    4,1
41 2250 IFOP=1THENSYSBO,10,30,1
    0,12,0,0,1,1
72 2260 IFOP=2THENSYSBO,10,30,1
    3,15,0,0,1,1
83 2270 IFOP=3THENSYSBO,10,30,1
    6,18,0,0,1,1
B5 2280 IFOP=4THENSYSBO,10,30,1
    9,21,0,0,1,1
F9 2290 GOTO2150
4E 2300 PRINT"[CLR]"
FA 2310 SYSBO,1,19,1,10,0,0,14,
    0
13 2320 SYSBO,1,19,11,20,13,18,
    14,0
8B 2330 SYSBO,20,38,1,10,0,0,14
    ,1
E6 2340 SYSBO,20,38,11,20,13,18

```

```

    ,14,1
3B 2350 GOSUB1110
8B 2360 PRINT"[CLR]"
B6 2370 SYSAT,6,2
EB 2380 PRINT"BOXES BY S.SCOTT
    - JUNE 1988"
DF 2390 END

```

FILE EXTENSION



PROGRAM: FILE EXTENSION

```

0 DIMB$(255),B(255):PRINT"(CLR) (
    WHT)INSERT DISK & PRESS (RVS)RET
    URN":POKE53280,0:POKE53281,0
1 GETA$:IFA$(>CHR$(13))THEN1:DATA
    ".8:",".8.1",".8.1",".8.1",".8.1"
2 M=1:OPEN4,4:OPEN15,8,15,"I":IN
    PUT#15,E:CLOSE15:IFE(>0)THEN0
3 PRINT"(CLR) (RVS)":OPEN15,8,15
    :FORT=1TO3:READA$(T),C$(T):NEXT
    OPEN5,8,0,"S"
4 FORT=1TO7:GET#5,A$:NEXT
5 GET#5,A$:IFSTTHEN9
6 IFA$(>CHR$(34))THEN5
7 FORT=1TO21:GET#5,A$:B$(N)=B$(N
    )+A$:IFA$=CHR$(34)THENB(N)=T
8 NEXT:PRINTCHR$(34)B$(N):N=N+1:
    GETA$:IFA$(>)" THEN4
9 PRINT"(CLR) (YEL)FILE NAME: (WHT
    )"CHR$(34)B$(M)" (DOWN) (DOWN)":FO
    RT=1TO3:PRINT"(YEL) (DOWN) (LEFT)"
    T"(WHT)"A$(T):NEXT
10 PRINT"(DOWN) (YEL)-(WHT) SCRAT
    CH(DOWN)":PRINT"(YEL)@ (WHT)DISK
    COMMAND(DOWN)":PRINT"(YEL)S (WH
    T)DISK STATUS":CLOSE5
11 P$=""
    ":PRINT"(DOWN) (YEL)R (WHT)RENAM
    E":PRINT"(DOWN) (YEL)P (WHT)HARD
    COPY"
12 GETA$:PRINT"(HOME)"TAB(11)B$(
    M):IFA$="(DOWN)"ANDM<N-1THENM=M+
    1:GOTO12
13 IFA$="(UP)"ANDM>1THENM=M-1:GO
    TO12
14 IFA$=""THEN12
15 IFA$="(CLR)"THENM=N-1
16 IFA$="(HOME)"THENM=1
17 IFA$="S"THENPRINT"(HOME) (DOWN
    ) (DOWN)"P$:INPUT#15,W,X$Y,Z:PRI
    NT"(UP)"W:X$Y:Z:GOTO12
18 IFA$="@ "THENINPUT"(CLR) (YEL)C
    OMMAND(WHT)":A$:PRINT#15,A$:GOTO
    9
19 IFA$="P"THENPRINT#4,"(RVS)":;
    FORT=0TON-1:PRINT#4,CHR$(34)B$(T
    ):NEXT
20 IFB$(M)=P$THEN12
21 IFA$=""THENPRINT#15,"S:"+LEF
    T$(B$(M),B(M)-1):B$(M)=P$
22 IFA$="R"THENC$=LEFT$(B$(M),B(
    M)-1):D$=RIGHT$(B$(M),3):GOTO29
23 A=VAL(A$):IFA>0ANDA<4THENC$=L
    EFT$(B$(M),B(M)-1):D$=RIGHT$(B(
    M),3):GOTO26
24 IFA$="" THENRUN
25 GOTO12
26 IFLEN(C$)+LEN(C$(A))>15THEN12
27 PRINT#15,"R:"C$ "C$(A)"="C$:
    E$=C$+CHR$(34)+A$(A)
28 B$(M)=LEFT$(E$+P$,18)+D$:GOTO
    12
29 PRINT"(CLR) (YEL)OLD FILE NAME
    = (WHT)"C$:PRINTTAB(16)"(BLU) (D

```

```

OWN) (DOWN) (DOWN)-----
    (UP) (UP)"
30 INPUT"(YEL)NEW FILE NAME (WHT
    )"Z$:IFZ$=""THEN9
31 B$(M)=LEFT$(Z$)+CHR$(34)+P$,
    18)+D$
32 PRINT#15,"R:"Z$="C$:B(M)=LEN
    (Z$)+1:Z$="":GOTO9

```

HI-RES COLOUR PLOTTER



PROGRAM: PLOT64 LOADER

```

79 10 FORA=49152TO50175STEP16:D
    =0
25 20 FORB=0TO15:READC:POKEA+B,
    C:D=D+C:NEXT
74 30 READCH:IFD(>CH)THENPRINT"C
    HECKSUM ERROR IN LINE"PEEK(6
    3)+256*PEEK(64):END
21 40 NEXT:POKE50176,96:END
E8 500 DATA32,253,174,32,235,18
    3,165,21,141,2,196,240,10,20
    1,2,176,2063
20 501 DATA15,165,20,201,64,176
    ,9,165,20,141,1,196,224,200,
    144,3,1744
86 502 DATA76,72,178,142,3,196,
    32,165,194,32,63,193,72,174,
    8,196,1796
F5 503 DATA240,119,166,254,208,
    16,1,251,129,251,104,169,4,3
    2,148,193,2285
96 504 DATA173,7,196,129,251,96
    ,174,8,196,224,1,208,36,202,
    73,255,2229
B9 505 DATA33,251,129,251,104,7
    4,1,251,129,251,169,4,32,148
    ,193,173,2193
64 506 DATA7,196,10,10,10,10,13
    3,253,161,251,41,15,5,253,12
    9,251,1735
89 507 DATA96,224,2,208,29,162,
    0,1,251,129,251,104,74,73,25
    5,33,1892
E1 508 DATA251,129,251,169,4,32
    ,148,193,161,251,41,240,13,7
    ,196,129,2215
A4 509 DATA251,96,162,0,1,251,1
    29,251,104,74,1,251,129,251,
    169,216,2336
63 510 DATA32,148,193,173,7,196
    ,129,251,96,73,255,33,251,12
    9,251,104,2321
6A 511 DATA164,254,240,7,74,73,
    255,33,251,129,251,96,32,253
    ,174,32,2318
DB 512 DATA235,183,165,21,141,2
    ,196,240,10,201,2,176,15,165
    ,20,201,1973
EE 513 DATA64,176,9,165,20,141,
    1,196,224,200,144,3,76,72,17
    8,142,1811
4A 514 DATA3,196,32,63,193,166,
    254,208,16,33,251,141,16,196
    ,169,4,1941
A7 515 DATA32,148,193,161,251,1
    41,17,196,96,72,162,0,33,251
    ,208,28,1989
E5 516 DATA104,74,33,251,141,16
    ,196,208,4,141,17,196,96,169
    ,4,32,1682

```



```

98 517 DATA148,193,161,251,74,7
4,74,74,141,17,196,96,141,16
,196,104,1956
FC 518 DATA74,33,251,208,13,169
,4,32,148,193,161,251,41,15,
141,17,1751
CE 519 DATA196,96,169,216,32,14
8,193,161,251,41,15,141,17,1
96,96,169,2137
F3 520 DATA0,133,251,169,32,133
,252,173,1,196,41,248,24,101
,251,133,2138
FA 521 DATA251,165,252,109,2,19
6,133,252,173,3,196,41,248,1
33,253,162,2569
DF 522 DATA5,32,200,193,162,3,3
2,200,193,173,3,196,41,7,101
,251,1792
90 523 DATA133,251,144,2,230,25
2,173,1,196,41,7,166,254,240
,2,41,2133
5B 524 DATA6,133,253,56,169,7,2
29,253,170,169,1,224,0,240,4
,10,1924
32 525 DATA202,208,252,96,133,2
52,169,0,133,251,173,1,196,7
4,74,74,2288
EA 526 DATA174,2,196,240,2,9,32
,24,101,251,133,251,144,3,23
0,252,2044
EA 527 DATA24,173,3,196,41,248,
133,253,162,2,32,200,193,165
,253,101,2179
FA 528 DATA251,133,251,144,2,23
0,252,96,169,0,141,15,196,16
5,253,10,2308
EB 529 DATA46,15,196,202,208,24
9,101,251,133,251,165,252,10
9,15,196,133,2522
FB 530 DATA252,96,32,253,174,32
,235,183,165,20,141,1,196,16
5,21,141,2107
37 531 DATA2,196,142,3,196,32,2
53,174,32,235,183,165,20,141
,4,196,1974
FO 532 DATA165,21,141,5,196,142
,6,196,32,165,194,24,173,1,1
96,141,1798
42 533 DATA12,196,109,4,196,141
,9,196,173,2,196,141,13,196,
109,5,1698
B9 534 DATA196,141,10,196,240,1
1,201,2,176,23,173,9,196,201
,64,176,2015
3F 535 DATA16,173,3,196,141,14,
196,109,6,196,141,11,196,201
,200,144,1943
E6 536 DATA3,76,72,178,32,41,19
2,173,1,196,205,9,196,208,8,
173,1763
BF 537 DATA2,196,205,10,196,240
,10,238,1,196,208,3,238,2,19
6,208,2149
CF 538 DATA227,32,41,192,173,3,
196,205,11,196,240,5,238,3,1
96,208,2166
6E 539 DATA240,32,41,192,173,1,
196,205,12,196,208,8,173,2,1
96,205,2080
6E 540 DATA13,196,240,15,206,1,
196,173,1,196,201,255,208,22
7,206,2,2336
B9 541 DATA196,240,222,32,41,19
2,173,3,196,205,14,196,240,6
,206,3,2165
5D 542 DATA196,76,147,194,96,32
,241,183,165,254,240,4,224,1
6,176,20,2264
7A 543 DATA142,7,196,32,241,183
,165,254,240,6,224,4,144,9,1
76,4,2027
66 544 DATA224,2,144,3,76,72,17
8,142,8,196,96,169,0,133,251
,168,1862

```

```

97 545 DATA169,32,133,252,152,1
62,31,145,251,136,208,251,23
0,252,202,208,2814
9E 546 DATA246,160,64,136,145,2
51,208,251,96,173,24,208,9,8
,141,24,2144
E6 547 DATA208,173,17,208,9,32,
141,17,208,165,254,240,8,173
,22,208,2083
3A 548 DATA9,16,141,22,208,96,1
73,24,208,41,247,141,24,208,
173,17,1748
B8 549 DATA208,41,223,141,17,20
8,173,22,208,41,239,141,22,2
08,96,32,2020
8E 550 DATA241,183,165,254,240,
4,224,16,176,9,134,253,32,24
1,183,224,2579
C8 551 DATA16,144,3,76,72,178,1
42,32,208,165,253,166,254,24
0,4,141,2094
04 552 DATA33,208,96,162,250,20
2,157,0,4,157,250,4,157,244,
5,157,2086
9A 553 DATA238,6,208,241,96,32,
241,183,224,1,240,7,224,8,24
0,3,2192
E9 554 DATA76,72,178,169,1,160,
255,32,186,255,165,157,240,1
,96,169,2212
E9 555 DATA28,141,136,2,169,13,
32,210,255,169,64,141,252,3,
169,80,1864
64 556 DATA141,253,3,169,73,141
,254,3,169,67,141,255,3,169,
4,162,2007
87 557 DATA252,160,3,32,189,255
,169,0,133,251,169,32,133,25
2,169,251,2450
82 558 DATA162,64,160,63,32,216,
,255,169,0,32,189,255,169,4,
133,252,2155
7A 559 DATA169,251,162,232,160,
7,32,216,255,165,254,240,13,
169,216,133,2674
DF 560 DATA252,169,251,162,232,
160,219,32,216,255,169,4,141
,136,2,96,2496
6D 561 DATA32,241,183,224,1,240
,7,224,8,240,3,76,72,178,169
,1,1899
5D 562 DATA168,32,186,255,165,1
57,240,1,96,32,189,255,162,2
,165,254,2359
E1 563 DATA240,1,232,134,253,6,
253,169,0,32,213,255,198,253
,208,247,2694

```

PROGRAM: PLOT64 DEMO

```

22 10 DEFFNA(X)=INT(RND(1)*X)
8D 20 POKE254,1:SYS49867:SYS498
97:SYS49951,0,0:SYS49634,0,0
,319,199,1,1:PL=49152
69 30 FORZ=1TO100
B1 40 SYSPL,FNA(320),FNA(200),1
,1
62 50 NEXT:C=9
E1 60 FORP=0TO1:IFP=1THENC=14
DC 70 XC=180-60*P:YC=110-40*P:S
=35-15*P
FD 80 FORK--STOS
0A 90 X=SQR(S*S-K*K):X2=2*X
2A 100 SYSPL,XC-X-1,YC-K,C,1
80 110 FORL--XTOXSTEP2.5:PO=1
9A 120 IFFNA(X2)-X>LTHENPO=0
77 130 SYSPL,XC+L,YC-K,C,PO
3D 140 NEXTL,K,P
95 150 GOTO150

```

CONSTRUCT A COMPILER



PROGRAM: CODEGEN

```

FB 10 GOSUB 150
40 20 IF DE% THEN PRINT "[SD]IS
K [SF]ILE ERROR! [SA]BORTING
[SC]ODEGEN." :END
8C 30 GOSUB 780
7C 40 IF DE% THEN PRINT "[SD]IS
K [SF]ILE ERROR! [SA]BORTING
[SC]ODEGEN." :END
08 50 :
59 60 GOSUB 1090
E1 70 IF VT%>1 THEN GOSUB 1880
EA 80 IF TT%>1 THEN GOSUB 2150
FB 90 GOSUB 2330
5E 100 :
3B 110 PRINT#3,CHR$(0);CHR$(0);

9C 120 CLOSE 3:CLOSE 2:PRINT "[
SS]TARTING ASSEMBLER.." :CLR:
LOAD"ASSEMBLE",8,1
B8 130 :
B6 140 :
CF 150 REM *****
*****
08 160 REM SETUP THE SYSTEM FOR
CODEGEN
DB 170 REM *****
*****
8E 180 :
94 190 PRINT "[CLR.SF.SC.SL] [S
C]OMPILER [SS]YSTEM [SV]ERSI
ON 1.0"
4D 200 PRINT "[SC]ODEGEN [SV]1.
0[SB]"
20 210 PRINT "[SC]OMMODEORE 64 [
SV]ERSION"
7E 220 PRINT "[SS]TEVE [SC]ARRI
E 1988[DOWN2]"
DA 230 DIM SL$(200)
D0 240 GOSUB 320
39 250 GOSUB 420:IF DE% THEN RE
TURN
58 260 GOSUB 590:IF DE% THEN RE
TURN
35 270 :
23 280 :
AD 290 RETURN
17 300 :
OD 310 :
C4 320 REM *****
*****
FB 330 REM GET FILENAME
D0 340 REM *****
*****
65 350 :
21 360 F$=""
30 370 INPUT "[SF]ILENAME";F$
A5 380 IF F$="" THEN 370
09 390 RETURN
AB 400 :
A1 410 :
20 420 REM *****
*****
CE 430 REM READ IN SYM FILE
2C 440 REM *****
*****
F9 450 :
F8 460 OPEN 2,8,2,F$+".SYM.S,R"

BB 470 IF DS OR ST THEN DE%=-1:
RETURN
6A 480 INPUT#2,VT%
51 490 IF VT%=1 THEN CLOSE 2:RE
TURN
71 495 IF ST THEN CLOSE 2:DE%=-
1:RETURN

```


LISTINGS

```

62 500 DIM VN$(VT%+1),VT%(VT%+1)
    ),VV$(VT%+1)
BE 510 PRINT "[DOWN,SR]EADING [
    SV]ARIABLES."
A1 520 FOR V=1 TO VT%-1
EF 530 : INPUT#2,VN$(V),VT%(V)
    ,VV$(V)
9C 540 NEXT
9A 550 CLOSE 2
BC 560 RETURN
06 570 :
7C 580 :
FF 590 REM *****
*****
99 600 REM READ LITERALS
CB 610 REM *****
*****
54 620 :
70 630 OPEN 2,8,2,F$+ ".LTR,S,R"

FA 640 IF DS OR ST THEN DE%=-1:
    RETURN
63 650 INPUT#2,TT%
E6 660 IF TT%=1 THEN CLOSE 2:RE
    TURN
5C 665 IF ST THEN DE%=-1:RETURN

93 670 DIM LT$(TT%+1),L%(TT%+1)

6D 680 PRINT "[SR]EADING LITERA
    LS."
1B 690 FOR LT=1 TO TT%-1
92 700 : INPUT#2,LE:L%(LT)=LE
    %
3C 710 : LT$=""
95 720 : IF LE%>0 THEN FOR Y=
    1 TO LE%:GET#2,A$:LT$(LT)=LT
    $(LT)+A$:NEXT
5E 730 NEXT
54 740 CLOSE 2
7E 750 RETURN
C0 760 :
3F 770 :
36 780 REM *****
*****
BC 790 REM OPEN WORK FILES
62 800 REM *****
*****
17 810 :
3F 820 OPEN 2,8,2,F$+ ".SFC,S,R"

3D 830 IF DS OR ST THEN DE%=-1:
    RETURN
71 840 :
D2 850 OPEN 3,8,3,"@0:"+F$+ ".AS
    M,P,W"
3F 860 IF DS OR ST THEN DE%=-1:
    CLOSE2:RETURN
2F 870 PRINT#3,CHR$(1);CHR$(8);

FD 880 RETURN
47 890 :
BD 900 :
14 910 REM *****
*****
A0 920 REM OUTPUT ASM LINE
20 930 REM *****
*****
95 940 :
EB 950 PRINT#3,CHR$(255);CHR$(0)
    );CHR$(0);CHR$(0);OL$:CHR$(0)
    );
D3 960 TL=TL+1:PRINT TL;"[LEFT]
    LINES.[SPC6]":PRINT"[UP]";
43 970 RETURN
ED 980 :
DB 990 :
1A 1000 REM *****
*****
50 1010 REM OUTPUT LIBRARY CALL
    LINE
26 1020 REM *****
*****
30 1030 :
81 1040 GOSUB 910

4A 1050 OL$=" JSR SYSLIB"
19 1060 GOTO 910
08 1070 :
06 1080 :
7F 1090 REM *****
*****
5B 1100 REM GENERATE PROGRAM HE
    ADER
8B 1110 REM *****
*****
5E 1120 :
B2 1130 PRINT "[SG]ENERATING [S
    P]ROGRAM [SH]EADER."
3B 1140 OL$=":[SC]ODEGEN [SV]1
    .0[SB]":GOSUB 910
BE 1150 OL$=":[SC]64 [SV]ERSIO
    N":GOSUB 910
C7 1160 OL$=":"GOSUB 910
8D 1170 OL$=" ORG $0801":GOSUB
    910
24 1180 OL$=" .BASIC":GOSUB 910
9E 1190 OL$=" BYT $0C,$08,$0A,$
    00,$9E,$20,$32":GOSUB 910
29 1200 OL$=" BYT $30,$36,$33,$
    00,$00,$00,$00":GOSUB 910
EA 1210 OL$=" JSR LOADLIB":GOSU
    B 910
BC 1220 OL$=" JMP MAINSTART":GO
    SUB 910
E1 1230 OL$=":"GOSUB 910
96 1240 OL$=":" ***** PROGRAM VA
    RIABLES *****:GOSUB 910
7C 1250 OL$=" .AC1 EQZ $03":GOSU
    B 910
51 1260 OL$=" .AC2 EQZ $05":GOSU
    B 910
C8 1270 OL$=" .SD1 EQZ $26":GOSU
    B 910
FF 1280 OL$=" .SD2 EQZ $3F":GOSU
    B 910
E1 1290 OL$=" .UP1 EQZ $FB":GOSU
    B 910
C0 1300 OL$=" .UP2 EQZ $FD":GOSU
    B 910
CB 1310 OL$=" .APT EQZ $45":GOSU
    B 910
6B 1320 OL$=" .TT1 EQZ $47":GOSU
    B 910
B3 1330 OL$=" .SYSLIB EQZ $5E":G
    OSUB 910
9E 1340 OL$=":"GOSUB 910
18 1350 OL$=" .LOADLIB":GOSUB 91
    0
33 1360 OL$=" LDA #2":GOSUB 910
50 1370 OL$=" LDY #1":GOSUB 910
92 1380 OL$=" LDX #8":GOSUB 910
E3 1390 OL$=" JSR $FFBA":GOSUB
    910
C7 1400 OL$=" LDA #6":GOSUB 910
EB 1410 OL$=" LDX #<SYSLIBNAME"
    :GOSUB 910
96 1420 OL$=" LDY #>SYSLIBNAME"
    :GOSUB 910
F6 1430 OL$=" JSR $FFBD":GOSUB
    910
8D 1440 OL$=" LDA #0":GOSUB 910
92 1450 OL$=" TAX":GOSUB 910
DC 1460 OL$=" LDY #$C0":GOSUB 9
    10
E5 1470 OL$=" JSR $FFD5":GOSUB
    910
5E 1480 OL$=" BCS LDERR":GOSUB
    910
99 1490 OL$=" JMP $C000":GOSUB
    910
32 1500 OL$=" .LDERR":GOSUB 910
C9 1510 OL$=" LDA #<LDERRM":GOS
    UB 910
6E 1520 OL$=" STA TT1":GOSUB 91
    0
27 1530 OL$=" LDA #>LDERRM":GOS
    UB 910
UB 910
AB 1540 OL$=" STA TT1+1":GOSUB
    910
A6 1550 OL$=" LDY #0":GOSUB 910
AD 1560 OL$=" .LDERRLP":GOSUB 91
    0
C0 1570 OL$=" LDA (TT1),Y":GOSU
    B 910
ED 1580 OL$=" BEQ LDERREXIT":GO
    SUB 910
83 1590 OL$=" JSR $FFD2":GOSUB
    910
10 1600 OL$=" INY":GOSUB 910
F0 1610 OL$=" BNE LDERRLP":GOSU
    B 910
C3 1620 OL$=" .LDERREXIT":GOSUB
    910
39 1630 OL$=" LDX #$80":GOSUB 9
    10
49 1640 OL$=" JMP ($0300)":GOSU
    B 910
BB 1650 OL$=":"GOSUB 910
67 1660 OL$=" .SYSLIBNAME":GOSUB
    910
F7 1670 OL$=" BYT 'SYSLIB':GOS
    UB 910
D0 1680 OL$=" .LDERRM":GOSUB 910
23 1690 OL$=" BYT '[SL]IBRARY [
    SF]ILE [SN]OT [SF]OUND.'.13"
    :GOSUB 910
51 1700 OL$=" BYT '[SR]UN [SA]B
    ORTED.'.13,0":GOSUB 910
3A 1710 RETURN
84 1720 :
F2 1730 :
39 1740 REM *****
*****
E1 1750 REM READ LINE FROM SFC
    FILE
35 1760 REM *****
*****
CA 1770 :
CE 1780 OC$=""
BD 1790 INPUT#2,SL
BA 1800 FOR X=1 TO SL
89 1810 : A$="":GET#2,A$:A$=A$
    +CHR$(0)
E3 1820 : SF=ST
B2 1830 : OC$=OC$+LEFT$(A$,1)
B5 1840 NEXT
CF 1850 RETURN
71 1860 :
6F 1870 :
AC 1880 REM *****
*****
53 1890 REM PROCESS VARIABLE TA
    BLE
98 1900 REM *****
*****
47 1910 :
15 1920 OL$=":" ***** VARIABLES
    *****:GOSUB 910
D3 1930 PT%=1
CB 1940 PRINT "[SG]ENERATING [S
    V]ARIABLES."
5B 1950 IF VT%(PT%)=1 THEN OL$=
    " ."+VN$(PT%)+ " WOR 0":GOSUB
    910
F7 1960 IF VT%(PT%)=2 THEN OL$=
    " ."+VN$(PT%)+ " BYT 0,0,0":GO
    SUB 910
35 1970 IF VT%(PT%)=3 THEN GOSU
    B 2050
A6 1980 IF VT%(PT%)=4 THEN GOSU
    B 2100
88 1990 PT%=PT%+1
6F 2000 IF PT%<VT% THEN 1950
FE 2010 OL$=":"GOSUB 910
65 2020 RETURN
CF 2030 :
C5 2040 :
6C 2050 OL$=" ."+VN$(PT%)+ " WOR"
    +STR$(VV$(PT%)):GOSUB 910

```


LISTINGS

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8C 2060 OL$=" RES"+STR$(2*VV%(P
T%)):GOSUB 910
90 2070 RETURN
12 2080 :
08 2090 :
D6 2100 OL$="."+VN$(PT%)+ " WOR"
+STR$(VV%(PT%)):GOSUB 910
14 2110 OL$=" RES"+STR$(4*VV%(P
T%)):GOSUB 910
DE 2120 RETURN
60 2130 :
5E 2140 :
BD 2150 REM *****
*****
20 2160 REM PROCESS LITERALS
E9 2170 REM *****
*****
B6 2180 :
C3 2190 LG=0
22 2200 PT%=1
41 2210 PRINT "[SG]ENERATING [S
L]ITERALS."
29 2220 OL$="; ***** LITERALS *
*****":GOSUB 910
07 2230 L$=STR$(LG):LB$="LIT"+R
IGHT$(L$,LEN(L$)-1)
6D 2240 OL$="."+LB$+" BYT"+STR$
(L$(PT%)):GOSUB 910
CB 2250 IF L$(PT%)>0 THEN OL$="
BYT "+LT$(PT%)+""":GOSUB 9
10
92 2260 LT$(PT%)=LB$
92 2270 PT%=PT%+1:LG=LG+1
8C 2280 IF PT%<TT% THEN 2230
39 2290 OL$=";":GOSUB 910
8A 2300 RETURN
35 2310 :
23 2320 :
48 2330 REM *****
*****
CB 2340 REM PROCESS SFC FILE
44 2350 REM *****
*****
7B 2360 :
59 2370 SB%=0:MR%=0:SP%=0:CS=0
07 2380 PRINT "[SG]ENERATING CO
DE."
C5 2390 GOSUB 1780:REM READ LIN
E FROM FILE
39 2400 GOSUB 2450:REM PROCESS
LINE
6F 2410 IF SF=0 THEN GOTO 2390
F3 2420 RETURN
BD 2430 :
AB 2440 :
E0 2450 REM *****
*****
87 2460 REM PROCESS LINE FROM S
FC FILE
FC 2470 REM *****
*****
83 2480 :
9C 2490 LP%=0
F8 2500 LP%=LP%+1
6F 2510 IF LP%>LEN(OC$) THEN RE
TURN
E0 2520 CC%=ASC(MID$(OC$,LP%,1)
)
88 2530 IF CC%>127 THEN 2630
CF 2540 :
90 2550 REM ***** CODES 1-33 **
***
30 2560 :
0E 2570 ON CC% GOSUB 2970,3100,
3180,3260,3380,3500,3610,374
0,3810
2F 2580 IF CC%>9 THEN ON CC%-9
GOSUB 3890,4030,4170,2830,43
50,4360,4390,4590,4600
D7 2590 IF CC%>18 THEN ON CC%-1
8 GOSUB 4610,4620,4630,4640,
4670,4670,4670,4670,4870
4C 2600 IF CC%>27 THEN ON CC%-2
7 GOSUB 4670,4670,4980,4990,
5000,5010
5C 2610 GOTO 2500
7C 2620 :
72 2630 REM ***** CODES 128 > *
****
60 2640 :
DB 2650 REM 128-138
F6 2660 ON CC%-127 GOSUB 5040,2
830,2830,2830,2830,5170,5180
,5210,5320,5440,5550
C6 2670 REM 139-146
AC 2680 IF CC%>138 THEN ON CC%-
138 GOSUB 5660,5790,5880,603
0,6040,6070,6200,2830
D0 2690 REM 147-154
A9 2700 IF CC%>146 THEN ON CC%-
146 GOSUB 6210,6220,2830,283
0,6250,6430,6340,2830
8A 2710 REM 155-162
3C 2720 IF CC%>154 THEN ON CC%-
154 GOSUB 2830,6550,6560,657
0,6580,6590,6600,6610
18 2730 REM 163-170
84 2740 IF CC%>162 THEN ON CC%-
162 GOSUB 6620,6630,6640,665
0,6660,6670,6680,6690
37 2750 REM 171-178
28 2760 IF CC%>170 THEN ON CC%-
170 GOSUB 6700,6710,6720,673
0,6740,6750,6760,6770
A2 2770 REM 179-186
EC 2780 IF CC%>178 THEN ON CC%-
178 GOSUB 6780,6790,6800,681
0,6820,6830,6840,6850
39 2790 REM 187-191
31 2800 IF CC%>186 THEN ON CC%-
186 GOSUB 6860,6870,6880,689
0,6900
14 2810 GOTO 2500
35 2820 :
73 2830 PRINT CC%;"[SN]OT IMPL
EMENTED"
AD 2840 RETURN
17 2850 :
0D 2860 :
EE 2870 REM *****
*****
58 2880 REM GET ADDRESS FROM LI
NE
FA 2890 REM *****
*****
65 2900 :
81 2910 LP%=LP%+1:AD=ASC(MID$(O
C$,LP%,1))
D9 2920 LP%=LP%+1:AD=AD+256*ASC
(MID$(OC$,LP%,1))
F3 2930 RETURN
BD 2940 :
AB 2950 :
E0 2960 REM *****
*****
0A 2970 REM *****
*****
D3 2980 REM CODE 1. LOAD AC2 IM
M.
06 2990 REM *****
*****
F9 3000 :
D8 3010 LP%=LP%+1:LO%=ASC(MID$(
OC$,LP%,1)):LO%=STR$(LO%)
0C 3020 LP%=LP%+1:HI%=ASC(MID$(
OC$,LP%,1)):HI%=STR$(HI%)
C9 3030 OL$=" LDA #"+RIGHT$(LO$
,LEN(LO$)-1):GOSUB 910
EA 3040 OL$=" LDX #"+RIGHT$(HI$
,LEN(HI$)-1):GOSUB 910
B1 3050 OL$=" STA AC2":GOSUB 91
0
98 3060 OL$=" STX AC2+1":GOSUB
910
87 3070 RETURN
2E 3080 :
24 3090 :
B7 3100 REM *****
*****
6E 3110 REM CODE 2. STACK AC2
83 3120 REM *****
*****
7C 3130 :
66 3140 OL$=" LDA #01":GOSUB 1
040
D4 3150 RETURN
5E 3160 :
54 3170 :
C7 3180 REM *****
*****
3F 3190 REM CODE 3. UNSTACK AC1
D3 3200 REM *****
*****
AC 3210 :
D7 3220 OL$=" LDA #02":GOSUB 1
040
24 3230 RETURN
8E 3240 :
84 3250 :
17 3260 REM *****
*****
01 3270 REM CODE 4. SAVE AC2 AT
ADDR
63 3280 REM *****
*****
DC 3290 :
00 3300 GOSUB 2870
55 3310 OL$=" LDA AC2":GOSUB 91
0
18 3320 OL$=" LDX AC2+1":GOSUB
910
FD 3330 OL$=" STA "+VN$(AD):GOS
UB 910
86 3340 OL$=" STX "+VN$(AD)+"+1
":GOSUB 910
AD 3350 RETURN
17 3360 :
0D 3370 :
EE 3380 REM *****
*****
0D 3390 REM CODE 5. LOAD AC2 FR
OM ADDR
FA 3400 REM *****
*****
65 3410 :
89 3420 GOSUB 2870
2C 3430 OL$=" LDA "+VN$(AD):GOS
UB 910
93 3440 OL$=" LDX "+VN$(AD)+"+1
":GOSUB 910
47 3450 OL$=" STA AC2":GOSUB 91
0
16 3460 OL$=" STX AC2+1":GOSUB
910
15 3470 RETURN
9F 3480 :
95 3490 :
06 3500 REM *****
*****
15 3510 REM CODE 6 INCREMENT IM
MEDIATE
12 3520 REM *****
*****
ED 3530 :
F1 3540 GOSUB 2870
07 3550 OL$=" INC "+VN$(AD):GOS
UB 910
53 3560 OL$=" BNE 3":GOSUB 910
11 3570 OL$=" INC "+VN$(AD)+"+1
":GOSUB 910
87 3580 RETURN
2E 3590 :
24 3600 :
B7 3610 REM *****
*****
E9 3620 REM CODE 7 DECREMENT IM
MEDIATE
83 3630 REM *****
*****
7C 3640 :
60 3650 GOSUB 2870
CC 3660 OL$=" DEC "+VN$(AD):GOS
UB 910
4D 3670 OL$=" LDA "+VN$(AD):GOS

```


LISTINGS

UB 910	92 4210 GOSUB 2870	OSUB 910
D5 3680 OL\$=" CMP #\$FF":GOSUB 910	05 4220 OL\$=" LDA "+VN\$(AD):GOSUB 910	B1 4730 OL\$=" LDX #>"+VN\$(AD):GOSUB 910
EE 3690 OL\$=" BNE 3":GOSUB 910	2A 4230 OL\$=" LDX "+VN\$(AD)+"1":GOSUB 910	59 4740 OL\$=" STA TT1":GOSUB 910
6E 3700 OL\$=" DEC "+VN\$(AD)+"1":GOSUB 910	24 4240 OL\$=" LDY "+VN\$(AD)+"2":GOSUB 910	46 4750 OL\$=" STX TT1+1":GOSUB 910
02 3710 RETURN	D1 4250 OL\$=" STA SD2":GOSUB 910	26 4760 OL\$=" LDA #\$14":GOSUB 1040
AC 3720 :	3E 4260 OL\$=" STX SD2+1":GOSUB 910	33 4770 IF CC%<=24 OR CC%>=28 THEN OL\$=" LDA #\$15":GOSUB 1040
9A 3730 :	C8 4270 OL\$=" STY SD2+2":GOSUB 910	CB 4780 IF CC%=25 OR CC%=26 THEN OL\$=" LDA #\$16":GOSUB 1040
F1 3740 REM *****	46 4280 RETURN	B5 4790 IF CC%=23 THEN OL\$=" LDA #\$17":GOTO 1040
02 3750 REM CODE 8 MOVE AC2 TO UP1	E8 4290 :	8D 4800 IF CC%=24 THEN OL\$=" LDA #\$18":GOTO 1040
CD 3760 REM *****	E6 4300 :	71 4810 IF CC%=25 THEN OL\$=" LDA #\$19":GOTO 1040
F2 3770 :	35 4310 REM *****	42 4820 IF CC%=26 THEN OL\$=" LDA #\$1A":GOTO 1040
5E 3780 OL\$=" LDA #\$03":GOSUB 1040	50 4320 REM CODES 14 & 15 STACK /UNST SD	09 4830 IF CC%=28 THEN OL\$=" LDA #\$1B":GOTO 1040
52 3790 RETURN	01 4330 REM *****	3D 4840 OL\$=" LDA #\$1C":GOTO 1040
DC 3800 :	3E 4340 :	3E 4850 :
5F 3810 REM *****	0C 4350 OL\$=" LDA #\$05":GOTO 1040	34 4860 :
5C 3820 REM CODE 9 MOVE AC2 TO UP2	D6 4360 OL\$=" LDA #\$06":GOTO 1040	A6 4870 REM *****
AB 3830 REM *****	19 4370 :	04 4880 REM CODE 27. UNSTACK AR RAY PTR
35 3840 :	17 4380 :	B2 4890 REM *****
D4 3850 OL\$=" LDA #\$04":GOSUB 1040	44 4390 REM *****	0D 4900 :
AD 3860 RETURN	76 4400 REM CODE 16. STRING OP PREFIX	59 4910 OL\$=" LDA #\$1D":GOTO 1040
17 3870 :	50 4410 REM *****	71 4920 :
0D 3880 :	6F 4420 :	6F 4930 :
EE 3890 REM *****	26 4430 LP%=LP%+1:CM=ASC(MID\$(O C\$,LP%,1))	AC 4940 REM *****
FC 3900 REM CODE 10. LOAD SD2 IMM.	38 4440 IF CM=164 THEN OL\$=" LDA #\$07"	E9 4950 REM CODES 30-32
FA 3910 REM *****	F6 4450 IF CM=165 THEN OL\$=" LDA #\$08"	98 4960 REM *****
65 3920 :	9C 4460 IF CM=166 THEN OL\$=" LDA #\$09"	47 4970 :
89 3930 GOSUB 2870	61 4470 IF CM=167 THEN OL\$=" LDA #\$0A"	A4 4980 OL\$=" LDA #\$1E":GOTO 1040
C8 3940 OL\$=" LDA "+LT\$(AD):GOSUB 910	99 4480 IF CM=168 THEN OL\$=" LDA #\$0B"	8F 4990 OL\$=" LDA #\$1F":GOTO 1040
CE 3950 OL\$=" LDX #<"+LT\$(AD)+"1":GOSUB 910	45 4490 IF CM=169 THEN OL\$=" LDA #\$0C"	F0 5000 OL\$=" LDA #\$20":GOTO 1040
41 3960 OL\$=" LDY #>"+LT\$(AD)+"1":GOSUB 910	F6 4500 IF CM=170 THEN OL\$=" LDA #\$0D"	88 5010 OL\$=" LDA #\$4D":GOTO 1040
D6 3970 OL\$=" STA SD2":GOSUB 910	C7 4510 GOSUB 1040	95 5020 :
DF 3980 OL\$=" STX SD2+1":GOSUB 910	37 4520 RETURN	83 5030 :
B5 3990 OL\$=" STY SD2+2":GOSUB 910	F9 4530 :	28 5040 REM *****
21 4000 RETURN	F7 4540 :	12 5050 REM *****
83 4010 :	24 4550 REM *****	97 5060 REM CODE 128. END
F9 4020 :	5F 4560 REM CODES 17-22	4E 5070 REM *****
12 4030 REM *****	30 4570 REM *****	D1 5080 :
5A 4040 REM CODE 11 SAVE SD2 AD DR	CF 4580 :	14 5090 IF SB% THEN SB%=0:OL\$=" RTS":GOTO 910
4E 4050 REM *****	17 4590 OL\$=" LDA #\$0E":GOTO 1040	5B 5100 OL\$=" LDA #\$4E":GOTO 1040
D1 4060 :	F6 4600 OL\$=" LDA #\$0F":GOTO 1040	33 5110 :
05 4070 GOSUB 2870	70 4610 OL\$=" LDA #\$10":GOTO 1040	2E 5120 :
BB 4080 OL\$=" LDA SD2":GOSUB 910	2B 4620 OL\$=" LDA #\$11":GOTO 1040	6D 5130 REM *****
74 4090 OL\$=" LDX SD2+1":GOSUB 910	0A 4630 OL\$=" LDA #\$12":GOTO 1040	D1 5140 REM CODES 133-134 BSET/WSET
43 4100 OL\$=" LDY SD2+2":GOSUB 910	75 4640 OL\$=" LDA #\$13":GOTO 1040	59 5150 REM *****
0E 4110 OL\$=" STA "+VN\$(AD):GOSUB 910	06 4650 :	06 5160 :
19 4120 OL\$=" STX "+VN\$(AD)+"1":GOSUB 910	7C 4660 :	02 5170 OL\$=" LDA #\$21":GOTO 1040
7F 4130 OL\$=" STY "+VN\$(AD)+"2":GOSUB 910	FF 4670 REM *****	F9 5180 OL\$=" LDA #\$22":GOTO 1040
B2 4140 RETURN	10 4680 REM CODES 23-26 / 28-29	60 5190 :
7C 4150 :	CB 4690 REM *****	5E 5200 :
6A 4160 :	54 4700 :	BD 5210 REM *****
A1 4170 REM *****	97 4710 GOSUB 2880	AF 5220 REM CODE 135. LOOP
5F 4180 REM CODE 12 LOAD SD2 AD DR	5A 4720 OL\$=" LDA #<"+VN\$(AD):G	E9 5230 REM *****
BD 4190 REM *****		
42 4200 :		

LISTINGS

```

*****
B6 5240 :
FF 5250 SP%=SP%+1
5B 5260 CN$=STR$(CS):CS=CS+1
E7 5270 SL$(SP%)="CTL"+RIGHT$(C
N$,LEN(CN$)-1)
CC 5280 OL$=" "+SL$(SP%):GOSUB
910
30 5290 RETURN
F2 5300 :
E8 5310 :
63 5320 REM *****
*****
33 5330 REM CODE 136. ENDLOOP
5F 5340 REM *****
*****
C0 5350 :
CD 5360 CN$=SL$(SP%):SP%=SP%-1
D3 5370 NC$=ASC(MID$(OC$,LP%+1,
1)+CHR$(0))
A1 5380 IF NC$<>0 THEN RETURN
F9 5390 OL$=" JMP "+CN$:GOSUB 9
10
25 5400 OL$=" "+CN$+"EX":GOSUB
910
B9 5410 RETURN
7B 5420 :
71 5430 :
FA 5440 REM *****
*****
9F 5450 REM CODE 137. WHILE
F6 5460 REM *****
*****
49 5470 :
DB 5480 CN$=SL$(SP%)+EX"
C7 5490 OL$=" LDA #$23":GOSUB 1
040
C7 5500 OL$=" BNE 3":GOSUB 910
11 5510 OL$=" JMP "+CN$:GOSUB 9
10
2B 5520 RETURN
95 5530 :
83 5540 :
28 5550 REM *****
*****
03 5560 REM CODE 138. WHEN
24 5570 REM *****
*****
DB 5580 :
E3 5590 OL$=" LDA #$23":GOSUB 1
040
53 5600 OL$=" BNE 3":GOSUB 910
A5 5610 OL$=" JMP "+CN$:GOSUB 9
10
19 5620 OL$=" "+CN$+"EX":GOSUB
910
9D 5630 RETURN
24 5640 :
12 5650 :
59 5660 REM *****
*****
02 5670 REM CODE 139. IF
55 5680 REM *****
*****
6A 5690 :
A3 5700 SP%=SP%+1
E5 5710 IN$=STR$(CS):CS=CS+1
AB 5720 SL$(SP%)="CTL"+RIGHT$(I
N$,LEN(IN$)-1)
72 5730 OL$=" LDA #$23":GOSUB 1
040
5C 5740 OL$=" BNE 3":GOSUB 910
B9 5750 OL$=" JMP "+SL$(SP%):GO
SUB 910
18 5760 RETURN
9A 5770 :
90 5780 :
1B 5790 REM *****
*****
8F 5800 REM CODE 140. ENDIF
17 5810 REM *****
*****
E8 5820 :
D4 5830 OL$=" "+SL$(SP%):GOSUB
910

```

```

AE 5840 SP%=SP%-1
7E 5850 RETURN
C0 5860 :
3E 5870 :
1D 5880 REM *****
*****
3C 5890 REM CODE 141. ELSE
48 5900 REM *****
*****
17 5910 :
A8 5920 IN$=SL$(SP%)
5D 5930 SL$(SP%)=IN$+"EX"
EA 5940 OL$=" JMP "+SL$(SP%):GO
SUB 910
EA 5950 OL$=" "+IN$:GOSUB 910
D1 5960 RETURN
53 5970 :
49 5980 :
C2 5990 REM *****
*****
29 6000 REM CODES 142-143 CHARO
UT/FOPEN
3E 6010 REM *****
*****
A1 6020 :
22 6030 OL$=" LDA #$24":GOTO 10
40
51 6040 OL$=" LDA #$25":GOTO 10
40
83 6050 :
F9 6060 :
12 6070 REM *****
*****
9D 6080 REM CODE 144. BEGIN
4E 6090 REM *****
*****
D1 6100 :
83 6110 IF SB% THEN RETURN
E4 6120 OL$="MAINSTART":GOSUB
910
87 6130 RETURN
29 6140 :
24 6150 :
B7 6160 REM *****
*****
4A 6170 REM CODES 145/ 147-148
83 6180 REM *****
*****
7C 6190 :
F5 6200 OL$=" LDA #$26":GOTO 10
40
C8 6210 OL$=" LDA #$27":GOTO 10
40
FF 6220 OL$=" LDA #$28":GOTO 10
40
54 6230 :
42 6240 :
E9 6250 REM *****
*****
D7 6260 REM CODE 151 SUBROUTINE
E5 6270 REM *****
*****
9A 6280 :
0E 6290 GOSUB 2870:SB%=-1
FC 6300 OL$=" "+VN$(AD):GOSUB 9
10
30 6310 RETURN
F2 6320 :
E8 6330 :
63 6340 REM *****
*****
C5 6350 REM CODE 153. CALL
5F 6360 REM *****
*****
C0 6370 :
14 6380 GOSUB 2870
8B 6390 OL$=" JSR "+VN$(AD):GOS
UB 910
97 6400 RETURN
19 6410 :
17 6420 :
44 6430 REM *****
*****
73 6440 REM CODE 152. RETURN

```

```

50 6450 REM *****
*****
6F 6460 :
8A 6470 OL$=" RTS":GOSUB 910
E7 6480 RETURN
49 6490 :
47 6500 :
94 6510 REM *****
*****
56 6520 REM CODES 156-191
E0 6530 REM *****
*****
9F 6540 :
6D 6550 OL$=" LDA #$29":GOTO 10
40
CB 6560 OL$=" LDA #$2A":GOTO 10
40
FE 6570 OL$=" LDA #$2B":GOTO 10
40
45 6580 OL$=" LDA #$2C":GOTO 10
40
98 6590 OL$=" LDA #$2D":GOTO 10
40
3F 6600 OL$=" LDA #$2E":GOTO 10
40
B2 6610 OL$=" LDA #$2F":GOTO 10
40
97 6620 OL$=" LDA #$30":GOTO 10
40
4A 6630 OL$=" LDA #$31":GOTO 10
40
21 6640 OL$=" LDA #$32":GOTO 10
40
14 6650 OL$=" LDA #$33":GOTO 10
40
20 6660 OL$=" LDA #$34":GOTO 10
40
07 6670 OL$=" LDA #$35":GOTO 10
40
7A 6680 OL$=" LDA #$36":GOTO 10
40
01 6690 OL$=" LDA #$37":GOTO 10
40
14 6700 OL$=" LDA #$38":GOTO 10
40
FB 6710 OL$=" LDA #$39":GOTO 10
40
C1 6720 OL$=" LDA #$3A":GOTO 10
40
CC 6730 OL$=" LDA #$3B":GOTO 10
40
AB 6740 OL$=" LDA #$3C":GOTO 10
40
06 6750 OL$=" LDA #$3D":GOTO 10
40
35 6760 OL$=" LDA #$3E":GOTO 10
40
80 6770 OL$=" LDA #$3F":GOTO 10
40
37 6780 OL$=" LDA #$40":GOTO 10
40
D6 6790 OL$=" LDA #$41":GOTO 10
40
B9 6800 OL$=" LDA #$42":GOTO 10
40
E8 6810 OL$=" LDA #$43":GOTO 10
40
8B 6820 OL$=" LDA #$44":GOTO 10
40
6A 6830 OL$=" LDA #$45":GOTO 10
40
2D 6840 OL$=" LDA #$46":GOTO 10
40
FC 6850 OL$=" LDA #$47":GOTO 10
40
7F 6860 OL$=" LDA #$48":GOTO 10
40
DE 6870 OL$=" LDA #$49":GOTO 10
40
38 6880 OL$=" LDA #$4A":GOTO 10
40
13 6890 OL$=" LDA #$4B":GOTO 10
40
0A 6900 OL$=" LDA #$4C":GOTO 10
40

```


Listings

PROGRAM: ASSEMBLE.LDR

```

D9 10 IF PEEK(44)=8 THEN PRINT
    "CHANGE START OF BASIC FIRST
    !!":END
AF 15 AD=2049
E3 20 FOR LN=100 TO 2430 STEP 1
    0
A3 25 : RT=0
91 30 : FOR OS=0 TO 15
C2 35 : READ BY:POKE AD+OS,
    BY
4D 40 : RT=RT+BY
99 45 : NEXT
DC 50 : READ TT:IF TT<>RT THEN
    PRINT "ERROR IN LINE":LN:EN
    D
2A 55 : AD=AD+16
BE 60 NEXT
FE 65 PRINT "SAVING 'ASSEMBLE'"

33 70 HI=INT(AD/256):LO=AD-HI*2
    56
1E 75 POKE 43,1:POKE 44,8:POKE
    45,LO:POKE 46,HI:SAVE"ASSEMB
    LE",8
CC 80 CLR
6F 85 :
60 90 :
61 100 DATA 12,8,10,0,158,32,50
    ,48,54,51,0,0,0,0,76,33, 532

```

```

85 110 DATA 22,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 22
2B 120 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
F1 130 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
FF 140 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
05 150 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
53 160 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
59 170 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
67 180 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
6D 190 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
3B 200 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
41 210 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
4F 220 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
95 230 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
A3 240 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
A9 250 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
76 260 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
7C 270 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
8A 280 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 0
03 290 DATA 0,0,0,0,0,0,46,69,88,
    69,44,80,44,87,46,65,83, 721

A2 300 DATA 77,64,48,58,13,197,
    78,84,69,82,32,198,73,76,69,
    78, 1296
70 310 DATA 65,77,69,32,40,46,6
    5,83,77,41,58,0,13,206,79,32
    , 983
C7 320 DATA 70,73,76,69,78,65,7
    7,69,32,71,73,86,69,78,59,32
    , 1077
E0 330 DATA 193,66,79,82,84,73,
    78,71,13,0,13,198,73,76,69,7
    8, 1246
8F 340 DATA 65,77,69,32,84,79,7
    9,32,76,79,78,71,59,32,208,7
    6, 1196
FF 350 DATA 69,65,83,69,32,212,
    82,89,32,65,71,65,73,78,13,0
    , 1098
F9 360 DATA 14,147,13,198,195,2
    04,32,193,83,83,69,77,66,76,
    69,82, 1601
88 370 DATA 46,13,214,69,82,83,
    73,79,78,32,49,46,49,47,56,5
    6, 1072
9F 380 DATA 13,211,84,69,86,69,
    32,195,65,82,82,73,69,32,49,
    57, 1268
91 390 DATA 56,56,13,0,13,13,19
    3,83,83,69,77,66,76,69,82,32
    , 981
33 400 DATA 208,65,83,83,32,0,3
    2,66,69,71,73,78,83,46,13,0,
    1002
30 410 DATA 13,193,83,83,69,77,
    66,76,89,32,67,79,77,80,76,6
    9, 1229
34 420 DATA 84,69,46,13,204,79,
    65,68,32,65,68,68,82,69,83,8
    3, 1178
C7 430 DATA 32,61,36,0,13,197,7
    8,68,32,65,68,68,82,69,83,83
    , 1035
92 440 DATA 32,32,61,36,0,66,82
    ,75,0,67,76,67,24,67,76,68,
    829
B7 450 DATA 216,67,76,73,88,67,
    76,86,184,68,69,88,202,68,69
    ,89, 1586
BA 460 DATA 136,73,78,88,232,73
    ,78,89,200,78,79,80,234,80,7
    2,65, 1735
6D 470 DATA 72,80,72,80,8,80,76
    ,65,104,80,76,80,40,82,84,73
    , 1152
30 480 DATA 64,82,84,83,96,83,6
    9,67,56,83,69,68,248,83,69,7
    3, 1377
25 490 DATA 120,84,65,88,170,84
    ,65,89,168,84,83,88,186,84,8
    8,65, 1611
A1 500 DATA 138,84,88,83,154,84
    ,89,65,152,66,67,67,144,66,6
    7,83, 1497
CB 510 DATA 176,66,69,81,240,66
    ,77,73,48,66,78,69,208,66,80
    ,76, 1539
E3 520 DATA 16,66,86,67,80,66,8
    6,83,112,65,68,67,0,65,78,68
    , 1073
68 530 DATA 11,65,83,76,22,66,7
    3,84,33,67,77,80,44,67,80,88
    , 1016
BB 540 DATA 55,67,80,89,66,68,6
    9,67,77,69,79,82,88,73,78,67
    , 1174
8B 550 DATA 99,74,77,80,110,74,
    83,82,121,76,68,65,132,76,68
    ,88, 1373
FF 560 DATA 143,76,68,89,154,76
    ,83,82,165,79,82,65,176,82,7
    9,76, 1575
29 570 DATA 187,82,79,82,198,83
    ,66,67,209,83,84,65,220,83,8
    4,88, 1760
EE 580 DATA 231,83,84,89,242,66
    ,89,84,0,87,79,82,1,69,81,90
    , 1457
E5 590 DATA 2,69,81,65,3,79,82,
    71,4,82,69,83,5,255,105,101,
    1156
6B 600 DATA 117,255,109,125,121
    ,97,113,255,255,41,37,53,255
    ,45,61,57, 1996
87 610 DATA 33,49,255,10,255,6,
    22,255,14,30,255,255,255,255
    ,255,255, 2459
32 620 DATA 36,255,255,44,255,2
    55,255,255,255,255,201,197,2
    13,255,205,221, 3412
6F 630 DATA 217,193,209,255,255
    ,224,228,255,255,236,255,255
    ,255,255,255,255, 3857
22 640 DATA 192,196,255,255,204
    ,255,255,255,255,255,255,255
    ,198,214,255,206, 3760
EA 650 DATA 222,255,255,255,255
    ,255,73,69,85,255,77,93,89,6
    5,81,255, 2639
D0 660 DATA 255,255,230,246,255
    ,238,254,255,255,255,255,255
    ,255,255,255,255, 4028
F2 670 DATA 76,255,255,255,255,
    108,255,255,255,255,255,32,2
    55,255,255,255, 3531
07 680 DATA 255,255,169,165,181
    ,255,173,189,185,161,177,255
    ,255,162,166,255, 3258
B0 690 DATA 182,174,255,190,255
    ,255,255,255,160,164,180,255
    ,172,188,255,255, 3450
18 700 DATA 255,255,74,255,70,8
    6,255,78,94,255,255,255,255,
    255,9,5, 2711
FB 710 DATA 21,255,13,29,25,1,1
    7,255,42,255,38,54,255,46,62
    ,255, 1623
CB 720 DATA 255,255,255,106,255
    ,102,118,255,110,126,255,255
    ,255,255,255,233, 3345
11 730 DATA 229,245,255,237,253
    ,249,225,241,255,255,255,133

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47	149,255,141,157, 3534	93	1020 DATA 173,23,8,201,1,208 .8,32,78,14,169,13,32,210,25 5,104, 1529		2,8,162,166,160,8,32,189,255 .32,192, 1890
AC	750 DATA 255,132,148,255,140 .255,255,255,255, 3403	D9	1030 DATA 170,142,19,8,189,9 5,13,168,189,94,13,170,32,25 5,13,173, 1743	C0	1310 DATA 255,176,83,162,2,3 2,198,255,176,76,32,228,255, 32,183,255, 2400
DE	760 DATA 83,69,77,66,76,89,3 2,70,65,73,76,83,32,79,78,32 .1080	01	1040 DATA 19,8,240,5,169,0,7 6,209,13,169,2,32,195,255,16 9,3, 1564	1B	1320 DATA 208,68,32,228,255, 32,183,255,208,60,32,204,255 .96,169,3, 2288
72	770 DATA 84,72,73,83,32,76,7 3,78,69,0,213,78,68,69,70,73 .1211	E7	1050 DATA 32,195,255,174,18, 8,232,232,154,162,128,108,0, 3,134,20, 1855	43	1330 DATA 168,162,8,32,186,2 55,173,33,8,162,198,160,8,32 .189,255, 2029
BB	780 DATA 78,69,68,32,211,89, 77,66,79,76,32,197,82,82,79, 82, 1399	A4	1060 DATA 132,21,160,0,177,2 0,240,6,32,210,255,200,208,2 46,96,201, 2204	B0	1340 DATA 32,192,255,176,33, 162,3,32,201,255,176,26,173, 30,8,32, 1786
C0	790 DATA 0,210,69,68,69,70,7 3,78,69,68,32,211,89,77,66,7 9, 1328	DF	1070 DATA 65,144,6,201,91,17 6,2,56,96,24,96,201,48,144,2 50,201, 1801	41	1350 DATA 210,255,32,183,255 .208,15,173,31,8,32,210,255, 32,183,255, 2337
CD	800 DATA 76,32,197,82,82,79, 82,0,205,78,69,77,79,78,73,6 7, 1356	7E	1080 DATA 58,176,246,144,242 .32,16,14,176,237,76,28,14,3 2,28,14, 1533	1B	1360 DATA 208,4,32,204,255,9 6,32,204,255,169,16,76,209,1 3,173,23, 1969
9F	810 DATA 32,78,79,84,32,82,6 9,67,79,71,78,73,83,69,68,0, 1044	68	1090 DATA 176,229,201,65,144 .227,201,71,176,223,144,219, 134,20,132,21, 2383	68	1370 DATA 8,9,48,141,230,9,1 62,213,160,9,76,255,13,230,2 51,208, 2022
27	820 DATA 194,65,68,32,211,89 .77,66,79,76,32,69,82,82,79, 82, 1383	B2	1100 DATA 160,0,177,20,32,21 0,255,200,201,13,208,246,96, 162,88,160, 2178	CB	1380 DATA 2,230,252,140,19,8 .160,0,177,251,172,19,8,96,1 98,251, 1983
7F	830 DATA 0,201,76,76,69,71,6 5,76,32,207,80,69,82,65,78,6 8, 1315	A4	1110 DATA 8,76,61,14,201,10, 176,3,9,48,96,105,54,96,72,7 4, 1103	C8	1390 DATA 165,251,201,255,20 8,2,198,252,96,32,15,16,169, 0,170,141, 2171
72	840 DATA 32,198,73,69,76,68, 0,201,76,76,69,71,65,76,32,2 05, 1387	2E	1120 DATA 74,74,74,32,85,14, 32,210,255,104,41,15,32,85,1 4,76, 1217	1C	1400 DATA 230,8,32,254,15,32 .38,14,176,4,142,230,8,96,15 7,231, 1667
F6	850 DATA 78,69,77,79,78,73,6 7,32,198,73,69,76,68,0,205,7 3, 1315	3D	1130 DATA 210,255,165,72,32, 95,14,165,71,76,95,14,32,115 .14,169, 1594	89	1410 DATA 8,232,208,238,32,2 54,15,32,4,16,201,32,240,246 .96,165, 2019
2C	860 DATA 83,83,73,78,71,32,2 07,80,69,82,65,78,68,32,197, 82, 1380	92	1140 DATA 32,32,210,255,76,7 8,14,169,38,162,8,133,20,134 .21,162, 1544	95	1420 DATA 45,166,46,133,5,13 4,6,160,0,177,5,208,2,24,96, 205, 1412
34	870 DATA 82,79,82,46,0,196,7 3,83,75,32,198,73,76,69,32,1 97, 1393	B6	1150 DATA 2,32,198,255,32,22 8,255,141,34,8,32,228,255,14 1,35,8, 1884	54	1430 DATA 230,8,208,40,162,0 .200,200,200,200,177,5,221,2 31,8,208, 2298
D6	880 DATA 82,82,79,82,46,0,21 1,89,78,84,65,88,32,69,82,82 .1251	5A	1160 DATA 208,10,173,34,8,20 8,5,32,204,255,56,96,32,228, 255,141, 1945	9D	1440 DATA 27,232,236,230,8,1 44,242,160,1,177,5,141,22,8, 200,177, 2010
56	890 DATA 79,82,46,0,201,76,7 6,69,71,65,76,32,209,85,65,7 8, 1310	98	1170 DATA 36,8,32,228,255,14 1,37,8,32,228,255,201,0,240, 13,160, 1874	4E	1450 DATA 5,141,20,8,200,177 .5,141,21,8,56,96,160,0,177, 5, 1220
17	900 DATA 84,73,84,89,32,197, 82,82,79,82,0,201,76,76,69,7 1, 1377	F9	1180 DATA 0,145,20,230,20,20 8,241,230,21,76,185,14,169,1 3,145,20, 1737	26	1460 DATA 24,105,4,101,5,133 .5,144,2,230,6,76,72,16,32,2 54, 1209
EB	910 DATA 65,76,32,193,68,68, 82,69,83,83,73,78,71,32,77,7 9, 1229	2D	1190 DATA 24,96,173,24,8,240 .1,96,162,9,76,190,13,169,0, 133, 1414	D4	1470 DATA 15,32,26,16,173,23 0,8,208,5,162,4,76,190,13,32 .64, 1254
D7	920 DATA 68,69,46,0,206,79,8 4,32,216,32,79,82,32,217,32, 73, 1347	F0	1200 DATA 71,133,72,165,45,1 66,46,133,69,134,70,160,0,15 2,145,69, 1630	AC	1480 DATA 16,144,12,162,2,17 3,23,8,201,1,208,5,76,190,13 .162, 1396
6D	930 DATA 78,68,69,88,46,0,21 1,89,77,66,79,76,32,84,65,66 .1194	AC	1210 DATA 162,161,160,9,32,2 55,13,96,169,0,141,230,8,160 .0,32, 1628	5D	1490 DATA 0,169,1,141,24,8,2 24,0,240,1,96,160,0,173,230, 8, 1475
24	940 DATA 76,69,32,70,85,76,7 6,46,0,194,82,65,78,67,72,32 .1120	6A	1220 DATA 207,255,201,13,240 .6,153,231,8,200,208,243,140 .230,8,96, 2439	8C	1500 DATA 145,69,200,169,2,1 45,69,200,165,71,145,69,200, 165,72,145, 2031
FD	950 DATA 210,65,78,71,69,32, 69,82,82,79,82,46,0,30,12,59 .1066	27	1230 DATA 162,69,160,9,32,25 5,13,32,249,14,173,230,8,208 .10,162, 1786	30	1510 DATA 69,200,162,0,189,2 31,8,145,69,232,200,236,230, 8,208,244, 2431
8A	960 DATA 12,82,12,105,12,129 .12,146,12,168,12,191,12,214 .12,231, 1362	01	1240 DATA 93,160,9,32,255,13 .76,234,13,201,13,144,10,162 .123,160, 1698	D3	1520 DATA 152,24,101,69,133, 69,165,70,105,0,133,70,201,1 60,208,5, 1665
4E	970 DATA 12,245,12,12,13,37, 13,55,13,74,13,169,38,162,10 .133, 1011	6C	1250 DATA 9,32,255,13,76,17, 15,160,0,185,66,9,153,198,8, 200, 1396	EB	1530 DATA 162,13,76,190,13,1 60,0,152,145,69,96,169,0,133 .3,133, 1514
7F	980 DATA 20,134,21,162,0,160 .2,185,231,8,209,20,208,9,13 6,16, 1521	F7	1260 DATA 192,3,208,245,162, 0,189,231,8,157,166,8,153,19 8,8,232, 2160	2B	1540 DATA 4,32,254,15,32,46, 14,176,1,96,201,65,176,4,41, 15, 1172
56	990 DATA 246,160,3,177,20,24 .96,232,224,62,176,250,165,2 0,105,4, 1964	12	1270 DATA 200,236,230,8,208, 240,162,0,189,54,9,153,198,8 .232,200, 2327	82	1550 DATA 144,2,233,55,24,6, 3,38,4,176,25,6,3,38,4,176, 937
96	1000 DATA 133,20,165,21,105, 0,133,21,24,144,218,173,230, 8,201,3, 1599	B1	1280 DATA 224,8,208,244,140, 33,8,174,230,8,160,0,185,62, 9,157, 1850	F4	1560 DATA 19,6,3,38,4,176,13 .6,3,38,4,176,7,5,3,133, 634
5A	1010 DATA 240,5,162,3,76,190 .13,32,124,13,176,246,96,138 .10,72, 1596	B5	1290 DATA 166,8,200,232,192, 4,208,244,142,32,8,96,169,2, 168,162, 2033	C4	1570 DATA 3,76,2,17,162,10,7 6,190,13,169,0,133,3,133,4,3 2, 1023
		61	1300 DATA 8,32,186,255,173,3	D4	1580 DATA 15,16,32,254,15,32 .28,14,176,1,96,41,15,72,165

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6D	1600 DATA 24.104.101.3.133.3 .104.105.0.133.4.176.199.6.3 .38. 1136	5F	1880 DATA 229.3.133.3.138.22 9.4.133.4.201.255.240.12.201 .0.208. 1993	1D	2160 DATA 6.76.190.13.32.26. 16.32.172.13.72.32.56.16.104 .32. 888
21	1610 DATA 4.176.193.104.24.1 01.3.133.3.165.4.105.0.133.4 .176. 1328	4A	1890 DATA 22.165.3.201.127.1 76.16.144.6.165.3.201.128.14 4.8.169. 1678	16	2170 DATA 122.20.76.155.20.2 24.56.208.3.76.106.21.224.57 .208.3. 1579
A0	1620 DATA 179.144.191.32.254 .15.133.3.169.0.133.4.32.254 .15.201. 1759	DB	1900 DATA 1.141.27.8.76.157. 18.162.14.76.190.13.141.29.8 .24. 1085	OE	2180 DATA 76.181.21.224.58.2 08.3.76.220.21.224.59.208.3. 76.8. 1666
66	1630 DATA 39.240.5.162.8.76. 190.13.76.254.15.76.179.17.1 73.25. 1548	FE	1910 DATA 105.30.133.253.169 .11.105.0.133.254.32.4.16.20 1.65.208. 1719	A9	2190 DATA 22.224.60.208.3.76 .82.21.32.56.16.32.156.17.16 5.3. 1173
A7	1640 DATA 8.240.36.201.60.24 0.4.165.4.133.3.169.0.133.4. 76. 1476	D7	1920 DATA 24.160.1.177.251.2 01.13.240.4.201.32.208.12.32 .254.15. 1825	63	2200 DATA 24.101.71.133.71.1 65.4.101.72.133.72.173.23.8. 201.2. 1354
72	1650 DATA 200.17.32.4.16.201 .13.240.229.201.40.240.225.2 01.41.240. 2140	A2	1930 DATA 169.0.141.27.8.168 .76.105.20.32.4.16.201.35.20 8.33. 1243	C2	2210 DATA 240.1.96.162.3.32. 201.255.169.0.166.3.164.4.20 2.224. 1922
DE	1660 DATA 221.201.44.240.217 .208.15.169.1.141.27.8.165.4 .240.5. 1906	55	1940 DATA 32.254.15.32.156.1 7.173.28.8.240.5.169.1.141.2 7.8. 1306	3E	2220 DATA 255.208.8.136.192. 255.208.3.76.204.255.32.210. 255.76.63. 2436
51	1670 DATA 169.2.141.27.8.96. 201.43.240.4.201.45.208.72.1 73.26. 1656	3C	1950 DATA 173.27.8.201.1.240 .5.162.10.76.190.13.160.1.76 .105. 1448	4B	2230 DATA 21.32.56.16.32.156 .17.165.3.166.4.133.71.134.7 2.141. 1219
14	1680 DATA 8.240.5.162.9.76.1 90.13.238.26.8.165.4.72.165. 3. 1384	23	1960 DATA 20.201.40.240.81.3 2.156.17.173.28.8.240.5.169. 2.141. 1553	D1	2240 DATA 30.8.142.31.8.96.3 2.53.16.32.56.16.201.39.240. 38. 1038
12	1690 DATA 72.32.4.16.72.32.2 54.15.32.156.17.104.201.43.2 40.24. 1314	09	1970 DATA 27.8.173.27.8.201. 1.208.2.160.2.201.2.208.2.16 0. 1390	OF	2250 DATA 32.156.17.165.4.24 0.5.162.10.76.190.13.32.111. 22.230. 1465
B0	1700 DATA 166.3.164.4.104.13 3.3.104.133.4.56.138.229.3.1 33.3. 1380	A5	1980 DATA 5.173.29.8.201.110 .240.4.201.121.208.2.160.5.1 92.5. 1664	E7	2260 DATA 71.208.2.230.72.32 .56.16.201.44.240.218.201.13 .208.1. 1813
E3	1710 DATA 152.229.4.133.4.76 .156.17.24.104.101.3.133.3.1 04.101. 1344	47	1990 DATA 208.5.169.2.141.27 .8.32.4.16.201.44.240.3.76.1 05. 1281	5F	2270 DATA 96.162.9.76.190.13 .32.254.15.201.39.240.14.133 .3.32. 1509
75	1720 DATA 4.133.4.76.156.17. 162.0.142.26.8.201.60.240.4. 201. 1434	4F	2000 DATA 20.32.254.15.201.8 8.240.10.201.89.240.5.162.12 .76.190. 1835	8C	2280 DATA 111.22.230.71.208. 2.230.72.76.151.21.32.254.15 .76.134. 1705
0A	1730 DATA 62.208.6.141.25.8. 32.254.15.201.39.208.6.32.13 2.17. 1386	FD	2010 DATA 13.200.200.76.105. 20.32.254.15.32.156.17.32.4. 16.201. 1373	40	2290 DATA 21.32.53.16.32.56. 16.32.156.17.32.119.22.165.7 1.24. 864
C9	1740 DATA 76.156.17.32.16.14 .144.54.32.26.16.32.64.16.17 6.25. 896	8F	2020 DATA 41.240.53.173.28.8 .240.5.169.1.141.27.8.173.27 .8. 1342	OF	2300 DATA 105.2.133.71.165.7 2.105.0.133.72.32.56.16.201. 44.240. 1447
C6	1750 DATA 169.1.141.28.8.173 .23.8.201.2.208.5.162.1.76.1 90. 1396	1D	2030 DATA 201.1.240.5.162.10 .76.190.13.32.4.16.201.44.24 0.5. 1440	D8	2310 DATA 224.201.13.208.1.9 6.162.9.76.190.13.32.211.14. 165.6. 1621
BA	1760 DATA 13.169.2.141.27.8. 76.156.17.169.0.173.20.8.133 .3. 1115	E4	2040 DATA 162.9.76.190.13.32 .254.15.201.88.208.244.32.25 4.15.201. 1994	2C	2320 DATA 72.165.5.72.32.156 .17.104.133.5.104.133.6.165. 4.240. 1413
4A	1770 DATA 173.21.8.133.4.173 .22.8.141.27.8.76.156.17.201 .36. 1204	DF	2050 DATA 41.208.237.160.8.7 6.105.20.32.254.15.201.44.24 0.10.169. 1820	1B	2330 DATA 5.162.10.76.190.13 .160.1.169.1.145.5.200.165.3 .145. 1450
55	1780 DATA 240.4.201.38.208.6 .32.252.16.76.156.17.32.28.1 4.144. 1464	78	2060 DATA 2.141.27.8.160.10. 76.105.20.173.28.8.240.5.169 .1. 1173	22	2340 DATA 5.200.165.4.145.5. 96.32.211.14.165.5.72.165.6. 72. 1362
EA	1790 DATA 6.32.58.17.76.156. 17.162.5.76.190.13.173.27.8. 24. 1040	34	2070 DATA 141.27.8.173.27.8. 201.1.240.5.162.10.76.190.13 .32. 1314	61	2350 DATA 32.156.17.104.133. 6.104.133.5.160.1.169.2.76.2 51.21. 1370
A4	1800 DATA 105.1.24.101.71.13 3.71.169.0.101.72.133.72.173 .23.8. 1257	96	2080 DATA 254.15.201.89.208. 186.160.9.177.253.201.255.24 0.6.141.29. 2424	60	2360 DATA 186.142.18.8.32.22 2.14.32.17.15.169.1.141.23.8 .32. 1060
03	1810 DATA 201.2.240.1.96.162 .3.32.201.255.173.29.8.32.21 0.255. 1900	93	2090 DATA 8.76.157.18.162.11 .76.190.13.224.56.144.3.76.2 46.20. 1480	05	2370 DATA 125.15.32.146.20.1 69.2.32.195.255.238.23.8.32. 125.15. 1432
7B	1820 DATA 32.183.255.240.3.7 6.231.15.172.27.8.240.29.165 .3.32. 1711	FA	2100 DATA 224.33.144.3.76.77 .19.224.25.144.3.76.249.18.7 6.238. 1629	B2	2380 DATA 32.175.15.32.146.2 0.32.77.22.76.234.13.162.241 .160.9. 1446
F0	1830 DATA 210.255.32.183.255 .240.3.76.231.15.136.240.13. 165.4.32. 2090	10	2110 DATA 18.169.0.133.71.13 3.72.32.239.15.32.136.14.8.1 69.38. 1279	F8	2390 DATA 32.255.13.173.31.8 .32.95.14.173.30.8.32.95.14. 162. 1167
24	1840 DATA 210.255.32.183.255 .240.3.76.231.15.76.204.255. 141.29.8. 2213	74	2120 DATA 162.8.133.251.134. 252.32.15.16.40.144.1.96.173 .23.8. 1488	A1	2400 DATA 21.160.10.32.255.1 3.32.115.14.169.13.76.210.25 5.169.1. 1545
60	1850 DATA 169.0.141.27.8.76. 157.18.141.29.8.32.156.17.17 3.23. 1175	79	2130 DATA 201.2.208.3.32.125 .14.169.0.141.24.8.141.25.8. 141. 1242	8A	2410 DATA 141.27.8.76.124.22 .169.2.141.27.8.173.23.8.201 .2. 1152
D6	1860 DATA 8.201.1.240.58.173 .27.8.201.1.240.51.165.71.24 .105. 1574	80	2140 DATA 26.8.141.28.8.32.5 3.16.201.59.240.206.201.46.2 08.6. 1479	2B	2420 DATA 240.1.96.162.3.32. 201.255.172.27.8.165.3.32.21 0.255. 1862
		9A	2150 DATA 32.143.16.32.56.16	AA	2430 DATA 136.240.5.165.4.32 .210.255.76.204.255.0.0.0.0. 0. 1582

MAY I INTERRUPT



PROGRAM: MAY I INTERRUPT

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DB 10 BL=209 :LN=50 :SA=4915
2
CO 20 FOR L=0 TO BL:CX=0:FOR D=
0 TO 15:READ A:CX=CX+A
B2 25 POKE53280,A:POKE SA+L*16+
D,A:NEXT D
A5 30 READ A:IF A>CX THENPRINT
"ERROR IN LINE":LN+(L*10):ST
OP
10 40 NEXT L:SYS52480
B4 50 DATA 0,0,0,0,0,21,21,21,2
1,21,21,21,21,23,23,23,237
D6 60 DATA 23,23,23,23,23,25,25
,25,25,25,25,25,19,19,19,
372
40 70 DATA 19,19,19,19,19,21,21
,21,21,21,21,21,23,23,23,
332
9A 80 DATA 23,23,23,23,23,25,25
,25,25,25,25,25,19,19,19,
372
DD 90 DATA 19,19,19,19,19,100,1
00,84,84,100,100,100,100,94,
94,94,1145
CB 100 DATA 94,79,79,79,79,84,8
4,84,84,75,75,75,75,75,75,75
,1271
E3 110 DATA 75,71,71,71,71,71,7
1,71,71,67,67,67,67,67,67,67
,1112
07 120 DATA 67,63,63,63,63,67,6
7,84,84,63,63,63,63,63,63,63
,1104
SF 130 DATA 63,63,63,63,63,50,5
0,42,42,50,50,50,50,47,47,47
,840
99 140 DATA 47,67,67,67,67,63,6
3,63,63,100,100,100,100,100,
100,100,1267
E9 150 DATA 100,94,94,94,94,94,
94,94,94,84,84,84,84,84,84,8
4,1440
77 160 DATA 84,79,79,94,94,84,8
4,94,94,79,79,79,79,79,79,79
,1339
8A 170 DATA 79,79,79,79,79,100,
100,84,84,100,100,100,100,94
,94,94,1445
58 180 DATA 94,79,79,79,79,84,8
4,84,84,75,75,75,75,75,75,75
,1271
33 190 DATA 75,71,71,71,71,71,7
1,71,71,67,67,67,67,67,67,67
,1112
D7 200 DATA 67,63,63,63,63,67,6
7,84,84,63,63,63,63,63,63,63
,1104
78 210 DATA 63,63,63,63,63,42,4
2,35,35,42,42,42,42,39,39,39
,754
3E 220 DATA 39,39,39,39,39,37,3
7,31,31,37,37,37,37,35,35,35
,584
5E 230 DATA 35,35,35,35,35,33,3
3,28,28,33,33,33,33,31,31,31
,522
F1 240 DATA 31,31,31,31,31,31,3
1,47,63,84,84,84,84,84,84,84
,923
38 250 DATA 84,84,84,84,84,0,0,
0,0,0,0,0,0,0,0,420
33 260 DATA 0,0,0,0,0,31,31,31,
31,31,31,31,31,181,181,181,7
91
J9 270 DATA 181,181,181,181,181
,30,30,30,30,30,30,30,30,239
,239,239,1862
32 280 DATA 239,239,239,239,239
,31,31,31,31,31,31,31,31,181

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,181,181,1986
95 290 DATA 181,181,181,181,181
,30,30,30,30,30,30,30,30,239
,239,239,1862
59 300 DATA 239,239,239,239,239
,121,121,125,125,121,121,121
,121,215,215,215,2816
D3 310 DATA 215,191,191,191,191
,125,125,125,125,69,69,69,69
,69,69,69,1962
8A 320 DATA 69,12,12,12,12,12,1
2,12,12,15,15,15,15,15,15
,270
33 330 DATA 15,75,75,125,125,15
,15,125,125,75,75,75,75,75,7
5,75,1220
DE 340 DATA 75,75,75,75,75,60,6
0,62,62,60,60,60,60,107,107,
107,1180
FD 350 DATA 107,15,15,15,15,75,
75,75,75,121,121,121,121,121
,121,121,1314
60 360 DATA 121,215,215,215,215
,215,215,215,215,125,125,125
,125,125,125,125,2716
61 370 DATA 125,191,191,215,215
,125,125,215,215,191,191,191
,191,191,191,191,2954
91 380 DATA 191,191,191,191,191
,121,121,125,125,121,121,121
,121,215,215,215,2576
83 390 DATA 215,191,191,191,191
,125,125,125,125,69,69,69,69
,69,69,69,1962
4A 400 DATA 69,12,12,12,12,12,1
2,12,12,15,15,15,15,15,15
,270
43 410 DATA 15,75,75,125,125,15
,15,125,125,75,75,75,75,75,7
5,75,1220
62 420 DATA 75,75,75,75,75,62,6
2,134,134,62,62,62,62,223,22
3,223,1684
0B 430 DATA 223,223,223,223,223
,162,162,165,165,162,162,162
,162,134,134,134,2819
0A 440 DATA 134,134,134,134,134
,135,135,49,49,135,135,135,1
35,165,165,165,2073
52 450 DATA 165,165,165,165,165
,165,223,107,75,125,125,125,
125,125,125,125,2270
49 460 DATA 125,125,125,125,125
,0,0,0,0,0,0,0,0,0,0,0,625
63 470 DATA 0,0,0,0,0,0,0,0,0,0
,17,17,17,17,17,17,17,17,17
,16,0,0,0,0,0,0,0,0,0,0,0,0
88 480 DATA 16,0,0,0,0,0,0,0,0
,16,0,0,0,0,0,0,0,0,0,0,0,0
16 490 DATA 16,0,0,0,0,0,0,0,0
,16,0,0,0,0,0,0,0,0,0,0,0,0
84 500 DATA 16,0,0,0,0,0,0,0,0
,16,0,0,0,0,0,0,0,0,0,0,0,0
16 510 DATA 16,0,0,0,0,0,0,0,0
,16,17,17,17,16,17,17,17,200
C9 520 DATA 16,17,17,17,16,17,1
7,17,16,17,16,17,16,17,17,17
,267
78 530 DATA 16,17,16,17,16,17,1
7,17,16,17,16,17,16,17,17,17
,266
73 540 DATA 16,17,16,17,16,17,1
6,17,16,17,17,17,16,0,0,0,21
5
A9 550 DATA 0,0,0,0,0,0,17,16,17
,16,17,17,17,16,17,17,17,184
B1 560 DATA 16,17,17,17,16,17,1
7,17,16,17,16,17,16,17,17,17
,267
83 570 DATA 16,17,16,17,16,17,1
7,17,16,17,16,17,16,17,17,17
,266
DB 580 DATA 16,17,16,17,16,17,1
6,17,16,17,17,17,16,0,0,0,21
5

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21 590 DATA 0,0,0,0,0,0,17,16,17
,16,17,17,17,16,17,17,17,184
59 600 DATA 16,17,17,17,16,17,1
7,17,16,17,16,17,16,17,17,17
,267
0B 610 DATA 16,17,16,17,16,17,1
7,17,16,17,16,17,16,17,17,17
,266
43 620 DATA 16,17,16,17,16,17,1
6,17,16,17,17,17,16,0,0,0,21
5
D9 630 DATA 0,0,0,0,0,0,17,16,17
,16,17,17,17,16,17,17,17,184
97 640 DATA 16,0,0,0,0,0,17,16,17
,16,17,17,17,16,17,17,17,200
C9 650 DATA 16,0,0,0,0,0,17,16,17
,16,17,17,17,16,17,17,17,200
5B 660 DATA 16,0,0,0,0,0,17,17,17
,17,17,17,17,17,17,17,17,203
9F 670 DATA 16,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0
39 680 DATA 0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0
59 690 DATA 84,10,10,10,10,12,1
2,12,12,10,10,10,10,14,14,14
,254
D7 700 DATA 14,10,10,10,10,14,1
4,14,14,10,10,10,10,14,14,14
,192
06 710 DATA 14,10,10,10,10,12,1
2,12,12,10,10,10,10,14,14,14
,184
CB 720 DATA 14,10,10,10,10,14,1
4,14,14,10,10,10,10,14,14,14
,192
31 730 DATA 14,10,10,10,10,15,1
5,15,15,10,10,10,10,16,16,16
,202
32 740 DATA 16,10,10,10,10,17,1
7,17,17,10,10,10,10,18,18,18
,218
51 750 DATA 18,10,10,10,10,21,2
1,21,21,10,10,10,10,23,23,23
,251
1F 760 DATA 23,21,21,21,21,21,2
1,21,21,21,21,21,21,10,9,8,3
02
05 770 DATA 7,7,7,7,7,16,16,16
,16,7,7,7,7,16,16,16,175
83 780 DATA 16,6,6,6,6,15,15,15
,15,5,5,5,5,14,14,14,162
53 790 DATA 14,11,11,11,11,15,1
5,15,15,11,11,11,11,17,17,17
,213
84 800 DATA 17,7,7,7,7,8,8,8,8
,7,7,7,7,7,6,125
91 810 DATA 5,5,5,5,5,15,15,15
,15,10,10,10,10,16,16,16,173
9D 820 DATA 16,10,10,10,10,17,1
7,17,17,10,10,10,10,18,18,18
,218
54 830 DATA 18,10,10,10,10,21,2
1,21,21,10,10,10,10,23,23,23
,251
67 840 DATA 23,21,21,21,21,21,2
1,21,21,21,21,21,21,25,23,21
,344
6B 850 DATA 18,17,17,17,17,11,1
1,11,11,11,11,11,11,23,21,19
,237
AC 860 DATA 17,15,15,15,15,10,1
0,10,10,10,10,10,10,21,18,17
,213
5E 870 DATA 15,14,14,14,14,9,9
,9,9,9,9,9,18,16,15,192
J6 880 DATA 14,12,12,12,12,11,1
1,11,11,21,21,21,21,21,21,21
,253
E3 890 DATA 21,21,21,21,21,0,0
,0,0,0,0,0,0,0,0,0,0,105
JE 900 DATA 125,143,143,143,143
,143,143,143,143,143,143,143

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LISTINGS

	,143,24,24,24,1913		17,17,16,17,17,17,16,17,17,1		28,28,28,25,25,25,25,25,2
OE	910 DATA 24,143,143,143,143,	EF	1200 DATA 16,17,17,17,16,17,	66	5,426
	239,239,239,239,143,143,143,		17,17,16,17,17,17,16,17,17,1		1490 DATA 25,25,25,25,25,29,
SA	143,24,24,24,2196		7,268		29,23,23,29,29,29,29,28,28,2
	920 DATA 24,143,143,143,143,	59	1210 DATA 16,17,17,17,16,17,	F3	8,429
	143,143,143,143,143,143,143,		17,17,16,17,17,17,16,17,17,1		1500 DATA 28,28,28,28,28,26,
A2	143,24,24,24,1812		7,268		26,21,21,26,26,26,26,25,25,2
	930 DATA 24,143,143,143,143,	79	1220 DATA 16,17,17,17,16,17,	OC	5,413
	239,239,239,239,143,143,143,		17,17,16,17,17,17,16,65,65,6		1510 DATA 25,25,25,25,25,23,
3A	143,24,24,24,2196		5,412		23,18,18,23,23,23,23,25,25,2
	940 DATA 24,143,143,143,143,	OF	1230 DATA 65,65,65,65,64,17,	01	5,374
	210,210,210,210,143,143,143,		17,17,16,17,17,17,16,17,17,1		1520 DATA 25,25,25,25,25,14,
45	143,195,195,195,2593		7,509		14,14,14,5,5,5,5,5,5,5,216
	950 DATA 195,143,143,143,143,	67	1240 DATA 16,17,17,17,16,17,	DO	1530 DATA 5,5,5,5,5,5,0,0,0,0,
	195,195,195,195,143,143,143,		17,17,16,17,17,17,16,17,17,1		0,0,0,0,0,0,0,0,25
13	143,209,209,209,2746		7,268	4E	1540 DATA 31,31,31,31,31,210
	960 DATA 209,143,143,143,143,	91	1250 DATA 16,17,17,17,16,17,		,210,210,210,210,210,210,210
	31,31,31,31,143,143,143,143,		17,17,16,17,17,17,16,17,17,1	67	,195,195,195,2420
C1	181,181,181,2020		7,268		1550 DATA 195,195,195,195,19
	970 DATA 181,31,31,31,31,31,	01	1260 DATA 16,17,17,17,16,17,		5,195,195,195,195,195,195,19
	31,31,31,31,31,31,143,104		17,17,16,17,17,17,16,65,65,6	D4	5,195,195,195,195,3120
S2	97,897		5,412		1560 DATA 195,195,195,195,19
	980 DATA 233,119,119,119,119,	56	1270 DATA 65,65,65,65,64,17,		5,210,210,210,210,210,210,21
	195,195,195,195,12,12,12,12,		17,17,17,17,17,17,16,65,65,6	78	0,210,195,195,195,3240
BE	195,195,195,2122		5,654		1570 DATA 195,195,195,195,19
	990 DATA 195,71,71,71,71,210	37	1280 DATA 65,65,65,65,64,17,		5,195,195,195,195,195,195,19
	,210,210,210,237,237,237,237,		17,17,17,17,17,17,16,65,65,6	A7	5,195,195,195,195,3120
76	239,239,239,2984	F9	1290 DATA 65,65,65,65,64,17,		1580 DATA 195,195,195,195,19
	1000 DATA 239,218,218,218,21		17,17,17,17,17,17,16,65,65,6		5,143,143,143,143,143,143,14
	8,210,210,210,210,218,218,21	35	1300 DATA 65,65,65,65,64,17,	C6	3,143,24,24,24,2191
F2	8,218,195,195,195,3408		17,17,16,17,17,17,17,17,17,1		1590 DATA 24,24,24,24,24,239
	1010 DATA 195,233,233,233,23		7,510		,239,239,239,239,239,239,239
	3,97,97,97,97,233,233,233,23	1E	1310 DATA 16,0,0,0,0,0,0,0,0,0	02	,210,210,210,2662
	3,233,12,71,2763		,0,0,0,0,0,0,0,0,16		1600 DATA 210,210,210,210,21
BF	1020 DATA 237,71,71,71,71,21	BE	1320 DATA 0,0,0,0,0,0,0,0,0,0		0,195,195,195,195,195,195,19
	0,210,210,210,143,143,143,14		,0,0,0,0,0,0,0,0,0,0	29	5,195,223,223,223,3279
02	3,195,195,195,2518	C2	1330 DATA 21,21,21,21,21,15,		1610 DATA 223,30,30,30,30,49
	1030 DATA 195,143,143,143,14		15,15,15,15,15,15,16,16,1		,49,49,49,30,30,30,30,30,30,
	3,195,195,195,195,143,143,14	F2	1340 DATA 16,16,16,16,16,17,	E3	30,749
AC	3,143,209,209,209,2746		17,17,17,17,17,17,16,16,1		1620 DATA 30,30,30,30,30,143
	1040 DATA 209,143,143,143,14		6,264	EB	,143,143,143,143,143,143,143
	3,31,31,31,31,143,143,143,14	7E	1350 DATA 18,16,16,16,16,15,		,247,247,247,2035
98	3,181,181,181,2020		15,15,15,15,15,15,16,16,1		1630 DATA 247,107,107,107,10
	1050 DATA 181,31,31,31,31,31,	4E	1360 DATA 16,16,16,16,16,17,		7,62,62,62,62,190,190,190,19
	31,31,31,31,31,31,30,181		17,17,17,17,17,17,16,16,1	31	0,190,190,190,2253
	,31,795	C1	1370 DATA 16,16,16,16,16,12,		1640 DATA 190,57,57,57,57,57
40	1060 DATA 209,195,195,195,19		12,12,12,12,12,12,14,14,1		,57,57,57,107,107,107,107,10
	5,218,218,218,218,218,218,21	OC	1380 DATA 14,14,14,14,14,14,	AO	7,107,107,1395
EB	8,218,181,31,239,3184		14,14,14,14,14,14,15,15,1		1650 DATA 107,210,210,210,21
	1070 DATA 195,210,210,210,21	C3	1390 DATA 15,15,15,15,15,17,		0,239,239,239,239,218,218,21
	0,143,143,143,143,143,143,14		17,17,17,17,17,17,39,39,3	39	8,218,218,218,218,3429
B6	3,143,31,209,195,2614	BF	1400 DATA 39,25,25,25,25,28,		1660 DATA 218,218,218,218,21
	1080 DATA 210,24,24,24,24,10		28,28,28,25,25,25,25,25,2		8,143,143,143,143,143,143,14
	4,104,104,104,104,104,104,10	75	1410 DATA 25,25,25,25,25,10,	56	3,143,24,24,24,2306
	4,209,195,210,1752		10,10,10,10,10,10,9,9,9,2		1670 DATA 24,24,24,24,24,239
E3	1090 DATA 24,143,143,143,143,		32		,239,239,239,239,239,239,239
	,218,218,218,218,31,31,31,31,	1B	1420 DATA 9,47,47,47,47,42,4	52	,210,210,210,2662
	31,31,31,1685		2,42,42,59,59,59,59,59,59		1680 DATA 210,210,210,210,21
FC	1100 DATA 31,31,31,31,31,0,0	F6	1430 DATA 59,53,53,53,53,53,		0,195,195,195,195,195,195,19
	,0,0,0,0,0,0,0,0,0,155		53,53,53,47,47,47,47,47,4	39	5,195,223,223,223,3279
B7	1110 DATA 0,17,17,17,16,17,1	CF	1440 DATA 47,15,15,15,15,14,		1690 DATA 223,30,30,30,30,49
	7,17,16,17,17,17,16,17,17,1		14,14,14,11,11,11,11,11,1		,49,49,49,30,30,30,30,30,30,
SF	,252	DC	1450 DATA 11,11,11,11,11,12,	59	30,749
	1120 DATA 16,17,17,17,16,17,		12,12,12,12,12,12,14,14,1		1700 DATA 30,30,30,30,30,223
	17,17,16,17,17,17,16,17,17,1	9C	1460 DATA 14,14,14,14,14,14,		,223,181,181,223,223,223,223
09	7,268		14,14,14,14,14,14,15,15,1	17	,49,49,49,1997
	1130 DATA 16,17,17,17,16,17,	D3	1470 DATA 15,15,15,15,15,17,		1710 DATA 49,49,49,49,49,156
	17,17,16,17,17,17,16,17,17,1		17,17,17,17,17,17,39,39,3		,156,31,31,156,156,156,156,3
43	7,268	OF	1480 DATA 39,25,25,25,25,28,	31	0,30,30,1333
	1140 DATA 16,17,17,17,16,17,				1720 DATA 30,30,30,30,30,181
	17,17,16,17,17,17,16,17,17,1				,181,209,209,181,181,181,181
9D	7,268			78	,30,30,30,1744
	1150 DATA 16,17,17,17,16,17,				1730 DATA 30,30,30,30,30,24,
	17,17,16,17,17,17,16,17,17,1				24,24,24,71,71,71,71,71,71,7
17	7,268			EC	1,743
	1160 DATA 16,17,17,17,16,17,				1740 DATA 71,71,71,71,71,0,0
	17,17,16,17,17,17,16,17,17,1			38	,0,0,0,0,0,0,0,0,355
C1	7,268				1750 DATA 0,0,0,0,0,0,17,17,
	1170 DATA 16,17,17,17,16,17,				,16,0,0,0,0,17,17,118
	17,17,16,17,17,17,16,17,17,1			ES	1760 DATA 16,0,0,0,0,17,17,1
	7,268				7,16,0,0,0,0,17,17,134
31	1180 DATA 16,17,17,17,16,17,			EF	1770 DATA 16,0,0,0,0,17,17,1
	17,17,16,17,17,17,16,65,65,6				7,16,0,0,0,0,17,17,134
	5,412			65	1780 DATA 16,0,0,0,0,17,17,1
37	1190 DATA 65,65,65,65,64,17,				7,16,0,0,0,0,17,17,134

BB 1790 DATA 16,0,0,0,0,17,17,1 7,16,0,0,0,0,17,17,134	7,16,17,17,17,16,17,17,17,2C 0	4A 2040 DATA 141,18,212,173,63, 204,201,194,208,21,173,62,20 4,201,152,208,2435
32 1800 DATA 16,0,0,0,0,17,17,1 7,16,0,0,0,0,17,17,134	18 1930 DATA 16,0,0,0,0,17,16,1 7,16,17,17,17,16,17,17,17,20 0	BE 2050 DATA 14,162,49,189,205, 204,157,62,204,202,16,247,76 ,182,204,162,2335
60 1810 DATA 16,0,0,0,0,17,17,1 7,16,0,0,0,0,17,17,134	96 1940 DATA 16,0,0,0,0,17,17,1 7,16,17,17,17,17,17,17,20 2	61 2060 DATA 0,32,196,204,162,6 ,32,196,204,162,12,32,196,20 4,162,18,1818
26 1820 DATA 16,17,17,17,16,17, 17,17,16,17,17,17,16,0,0,0,2 17	98 1950 DATA 16,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,16	96 2070 DATA 32,196,204,162,24, 32,196,204,162,30,32,196,204 ,162,36,32,1904
49 1830 DATA 0,0,0,0,0,17,17,17, 16,0,0,0,0,17,17,17,118	3C 1960 DATA 0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0	AC 2080 DATA 196,204,162,42,32, 196,204,162,48,32,196,204,16 9,1,141,25,2014
12 1840 DATA 16,17,17,17,16,17, 17,17,16,17,16,17,16,17,17,1 7,267	7C 1970 DATA 173,255,204,240,6, 206,255,204,76,188,204,169,4 ,141,255,204,2784	96 2090 DATA 208,76,49,234,254, 62,204,208,3,254,63,204,96,8 0,193,141,2329
66 1850 DATA 16,17,16,17,16,17, 17,17,16,17,16,17,16,17,17,1 7,266	EC 1980 DATA 169,15,141,24,212, 169,9,141,5,212,169,57,141,6 ,212,169,1851	CF 2100 DATA 0,212,173,0,192,14 1,1,212,173,160,194,141,4,21 2,173,80,2068
2E 1860 DATA 16,17,17,17,16,17, 17,17,16,17,17,17,16,0,0,0,2 17	AE 1990 DATA 10,141,12,212,169, 56,141,13,212,169,9,141,19,2 12,169,9,1694	48 2110 DATA 197,141,7,212,173, 0,196,141,8,212,173,160,198, 141,11,212,2182
71 1870 DATA 0,0,0,0,0,17,17,17, 16,0,0,0,0,17,17,17,118	43 2000 DATA 141,20,212,169,7,1 41,10,212,169,128,141,9,212, 173,80,193,2017	FS 2120 DATA 173,80,201,141,14, 212,173,0,200,141,15,212,173 ,160,202,0,2097
42 1880 DATA 16,0,0,0,0,17,17,1 7,16,0,0,0,0,17,17,134	F4 2010 DATA 141,0,212,173,0,19 2,141,1,212,173,160,194,141, 4,212,173,2129	CA 2130 DATA 120,169,31,141,13, 220,141,13,221,173,13,220,17 3,13,221,169,2051
30 1890 DATA 16,0,0,0,0,17,17,1 7,16,0,0,0,0,17,17,134	56 2020 DATA 80,197,141,7,212,1 73,0,196,141,8,212,173,160,1 98,141,11,2050	CF 2140 DATA 0,141,20,3,169,204 ,141,21,3,169,1,141,26,208,8 8,96,1431
76 1900 DATA 16,17,17,17,16,17, 17,17,16,17,17,17,16,0,0,0,2 17	97 2030 DATA 212,173,80,201,141 ,14,212,173,0,200,141,15,212 ,173,160,202,2309	
BC 1910 DATA 0,0,0,0,0,17,16,17 ,16,17,17,17,16,17,17,17,184		
7E 1920 DATA 16,0,0,0,0,17,16,1		

JOYSTICK CURSOR



PROGRAM: JOYCURS.SRC

THIS PROGRAM ONLY TO BE ENTERED
IF YOU ARE USING AN ASSEMBLER.

```

10 OPEN1,8,1,"JOYCURS.OBJ":SYS32768
20 .OPT P,01:..SYM 2
30 ;
100 ;"
110 ;"
120 ;"JOYSTICK CURSOR V2.3"
130 ;"
140 ;" J. KEW, JAN 88
150 ;"
160 ;" SOURCE CODE FOR
170 ;" ASSEMBLER/MONITOR 64
180 ;"
190 ;
200 *=$033C
210 INT = $0314
220 JV = $DC00
230 XMAX = $0289
240 BUFL = $C6
250 KBUF = $0277
260 ;PLUS TBITZ. END OF PROG
290 ;
300 INIT SEI ;TOGGLE
310 : LDA #<TBITZ ;ROUTINE
320 : EOR INT ;ON/OFF
330 : STA INT
340 : LDA #>TBITZ
350 : EOR INT+1
360 : STA INT+1
370 : CLI
380 : RTS

```

```

390 ;
400 START LDA JV
410 : AND #$1F ;ISOLATE J/S BITS
420 : TAY
430 : LDA TAB,Y ;LOAD CHARACTER
440 : BEQ OUT1 ;FINISH IF NULL
450 : CMP LASTC ;COMPARE WITH LAST
460 : BNE RESDL ;IF DIFF, BRANCH
461 : LDX RFLG ;REPEAT FLAG
462 : BNE DECCL ;REPEAT ON
463 : BEQ OUT
470 RESDL LDX #10 ;RESET DELAY
480 : STX REPD
490 : BNE CHARP ;JUMP
500 DECCL LDX REPD
510 : BEQ DECCT ;IF DELAY=0
520 : DEX ;DECREMENT
530 : STX REPD
540 : BEQ RESCT ;IF DELAY NOW=0
550 : BNE OUT ;IF NOT, FINISH
560 DECCT DEC REPD ;DEC COUNTER
570 : BNE OUT ;IF NOT=0, FINISH
580 RESCT LDX #4 ;IF =0, RESET
590 : STX REPD
600 CHARP LDX BUFL ;PROCESS CHAR
610 : CPX XMAX
620 : BEQ OUT ;IF FULL, FINISH
630 : STA KBUF,X ;STORE CHAR
640 : INX ;INC LENGTH

```


LISTINGS

```

650 : STX BUFFL
660 OUT1 STA LASTC
670 OUT JMP $EA31 ;EXIT
690 ;
700 LASTC .BYT $00
710 REPCT .BYT $04
720 REPD L .BYT $0A
730 RFLG .BYT $01
790 ;
800 : - - - - - FSE
810 TAB .BYT $00,$00,$00,$00,$00,$00
820 ;
830 : FNE FE - FSW FNW FW
840 : .BYT $00,$94,$00,$00,$00,$14

850 ;
860 : - FS FN F - -
870 : .BYT $00,$20,$0D,$00,$00,$00
880 ;
890 : - - - SE NE E
900 : .BYT $00,$00,$00,$1D,$1D,$1D
910 ;
920 : - SW NW W - S
930 : .BYT $00,$9D,$9D,$9D,$00,$11
940 ;
950 : N -
960 : .BYT $91,$00
970 ;
1000 TBITZ = START + $EA31

```

PROGRAM: JOYCURS

```

6D 10 A=A+1:IFA=1THENLOAD"JOYCU
RS.OBJ",8,1
28 20 SYS828
EB 30 POKE53280,0:POKE53281,0:P
RINT"[CLR,DOWN,WHITE]";CHR$(
14):TAB(13);"[SJ]OYSTICK[SC]
URSOR"
B1 40 PRINTTAB(13)"[CT14]"
53 50 PRINT"[DOWN]";TAB(12);"[C
8.SJ]. [SK]EW[SPC3.SJ]AN '88
"
0D 60 PRINT"[DOWN3,RIGHT9,SU]SE
A JOYSTICK IN PORT 2."
13 70 PRINT"[DOWN,RIGHT2,SS.SY.
SS] 828[SPC4]: TOGGLES ROUTI
NE ON/OFF."
DD 80 PRINT"[RIGHT2,SP,SO,SK,SE
1 922,1 : REPEAT JOYKEYS"
63 90 PRINT"[RIGHT2,SP,SO,SK,SE
1 922,0 : REPEAT OFF"
0E 100 PRINT"[DOWN,RIGHT2,SU]SE
PROGRAM [SJ,SO,SY,SM,SO,SD]
TO MODIFY ROUTINE."
E9 110 PRINT"[DOWN2,RIGHT5,SJ]O
YSTICK CURSORING IS NOW [SO,
SN]."
C5 120 PRINT"[DOWN3,C5,SPC10,SP
]RESS A KEY TO EXIT.[WHITE]"
1F 130 GETA$:IFA$=""THEN130
C6 140 PRINT"[CLR]"

```

PROGRAM: JOYMOD

```

6D 10 A=A+1:IFA=1THENLOAD"JOYCU
RS.OBJ",8,1
5C 20 POKE53281,0:POKE53280,0:P
RINTCHR$(142)"[WHITE]";GOSUB
400:PRINT"[DOWN4]MODIFY (Y/N
) ?"
B2 30 GETA$:IFA$=""THEN30
B8 40 IFA$="N"THEN160
FD 50 IFA$<>"Y"THEN30
2A 60 FORN=1TO17:READR$,DD$,P:
GOSUB400
E3 70 PRINT"[HOME,DOWN4]";TAB(3
0);"N[RIGHT,DOWN2]E[DOWN2,LE
FT3]S[LEFT3,UP2]W[RIGHT]";DD
$
15 80 PRINT"[HOME,DOWN10]PRESS
KEY FOR DIRECTION OR + FOR N
ULL":PRINT"[DOWN]";DR$
BC 90 GETA$:IFA$=""THEN90

```

```

7D 100 POKE923+P,ASC(A$):NEXTN
24 110 GOSUB400:PRINT"[DOWN4]RE
PEAT FLAG ON (Y/N) ?"
14 120 GETA$:IFA$=""THEN120
4B 130 RF=0:IFA$="Y"THENRF=1:GO
TO160
DA 140 IFA$<>"N"THEN120
2E 150 POKE922,RF
81 160 GOSUB400
22 170 PRINT"[DOWN4]SAVE (Y/N)
?"
E2 180 GETA$:IFA$=""THEN180
32 190 IFA$="N"THEN230
61 200 IFA$<>"Y"THEN180
72 210 PRINT:INPUT"FILENAME ";F
$
94 220 SYS57812F$,8,1:POKE193.6
0:POKE194.3:POKE174.188:POKE
175.3:SYS62957
EE 230 PRINT"[CLR]":END
8B 300 DATA"NORTH","[SW,UP,LEFT
,S-]",30,"NORTHEAST","[SW,UP
,SN]",22,"EAST","[SW,S*]",23
C1 310 DATA"SOUTHEAST","[SW,DOW
N,SM]",21,"SOUTH","[SW,DOWN,
LEFT,S-]",29,"SOUTHWEST","[S
W,DOWN,LEFT2,SN]",25
15 320 DATA"WEST","[SW,LEFT2,S*
]",27,"NORTHWEST","[SW,UP,LE
FT2,SM]",26,"FIRE","[SQ]",15
A0 330 DATA"FIRE+NORTH","[SQ,UP
,LEFT,S-]",14,"FIRE+NORTHEAS
T","[SQ,UP,SN]",6,"FIRE+EAST
","[SQ,S*]",7
6B 340 DATA"FIRE+SOUTHEAST","[S
Q,DOWN,SM]",5,"FIRE+SOUTH","[
SQ,DOWN,LEFT,S-]",13
C1 350 DATA"FIRE+SOUTHWEST","[S
Q,DOWN,LEFT2,SN]",9,"FIRE+WE
ST","[SQ,LEFT2,S*]",11
15 360 DATA"FIRE+NORTHWEST","[S
Q,UP,LEFT2,SM]",10
CB 400 PRINT"[CLR,DOWN]";TAB(9)
:"MODIFY JOYSTICK CURSOR"
9B 410 PRINTTAB(9)"[CY22]"
2B 420 RETURN

```

PROGRAM: JOYCURS.LOADER

```

86 10 BL=7:LN=50:SA=828
5B 20 FOR L=0 TO BL:CX=0:FOR D=
0 TO 15:READ A:CX=CX+A:POKE
SA+L*16+D,A:NEXT D
A5 30 READ A:IF A<CX THENPRINT
"ERROR IN LINE";LN+(L*10):ST
OP
86 40 NEXT L
62 50 DATA 120,169,126,77,20,3,

```

```

141,20,3,169,233,77,21,3,141
,21,1344
E8 60 DATA 3,88,96,173,0,220,41
,31,168,185,155,3,240,55,205
,151,1814
A3 70 DATA 3,208,7,174,154,3,20
8,9,240,46,162,10,142,153,3,
208,1730
DE 80 DATA 23,174,153,3,240,8,2
02,142,153,3,240,7,208,26,20
6,152,1940
A0 90 DATA 3,208,21,162,4,142,1
52,3,166,198,236,137,2,240,9
,157,1840
B9 100 DATA 119,2,232,134,198,1
41,151,3,76,49,234,0,4,10,1,
0,1354
3D 110 DATA 0,0,0,0,0,0,148,0,0
,0,20,0,32,13,0,0,213
4E 120 DATA 0,0,0,0,29,29,29,0,
157,157,157,0,17,145,0,0,720
88 130 PRINT "[CLR]THE DATA FOR
JOYCURSOR IS NOW IN THE"
91 140 PRINT "CASSETTE BUFFER."
46 150 PRINT "IF YOU ARE A DISK
USER THEN YOU CAN SAVE";
C0 160 PRINT "THE PROGRAM AS MA
CHINE CODE BY TYPING"
34 170 PRINT" POKE 43,60:POKE44
,3:POKE45,188:POKE46,3"
3D 180 PRINT" CLR:SAVE"+CHR$(34
)+"JOYCURS.OBJ"+CHR$(34)+"",8
"
29 190 PRINT"IF YOU ARE USING C
ASSETTE THEN YOU WILL"
FE 200 PRINT"HAVE TO ADD THIS P
ROGRAM TO ANY"
00 210 PRINT"PROGRAM THAT YOU W
ISH TO USE JOYCURSOR"
55 220 PRINT"WITH. [RVSON]NOTE[
RVSOFF] ANY CASSETTE LOAD OR
SAVE"
BA 230 PRINT"WILL ERASE THE JOY
CURSOR PROGRAM."
B1 240 PRINT " IF YOU KNOW HOW
TO USE AN ASSEMBLER"
E4 250 PRINT "YOU COULD RELOCAT
E THE MACHINE CODE TO "
B7 260 PRINT "ANOTHER ADDRESS B
Y ENTERING THE"
5F 270 PRINT"ASSEMBLER RATHER T
HAN THE BASIC LOADER."
20 280 PRINT" IF YOU DO NOT SAV
E JOYCURS.OBJ THEN YOU";
58 290 PRINT"YOU MUST DELETE THE LO
AD INSTRUCTIONS FROM"
B2 300 PRINT"THE OTHER PROGRAMS
FOR THIS ARTICLE AND"
D2 310 PRINT"MAKE SURE THAT YOU
HAVE RUN THIS PROG."
E0 320 PRINT"BEFORE RUNNING THE
M."

```


HI-RES FILL



PROGRAM: HI-RES FILL

```

47 10 P=49152
69 20 READX:IFX=-1THENEND
4D 30 POKEP,X
BF 40 FORC=1TO7:READY:POKEP+C,Y
:X=X+Y:NEXTC
77 50 READH:IFH<>XTHENPRINT"ERR
OR IN LINE"PEEK(63)+PEEK(64)
*256:END
95 60 P=P+8:GOTO20
D7 1000 DATA 169.57,141.24,208,
173.2,221,995
8F 1010 DATA 9.3,141.2,221,169,
148,141,834
FD 1020 DATA 0.221,169,204,141,
136,2,173,1046
FF 1030 DATA 17.208,9.32,141,17,
208,96,728
85 1040 DATA 169,21,141,24,208,
173,2,221,959
A7 1050 DATA 9.3,141.2,221,169,
151,141,837
61 1060 DATA 0.221,169,4,141,13
6,2,173,846
9D 1070 DATA 17.208,41,223,141,
17,208,96,951
31 1080 DATA 169,0,162,224,133,
251,134,252,1325
AF 1090 DATA 160,0,145,251,200,
208,251,230,1445
70 1100 DATA 252,208,247,96,165,
20,24,41,1053
82 1110 DATA 248,121,112,192,13
3,78,165,21,1070
1B 1120 DATA 121,137,192,133,79,
165,156,41,1024
77 1130 DATA 7,168,165,20,41,7,
170,96,674
68 1140 DATA 0.64,128,192,0.64,
128,192,768
76 1150 DATA 0.64,128,192,0.64,
128,192,768
54 1160 DATA 0.64,128,192,0.64,
128,192,768
2C 1170 DATA 0.224,225,226,227,
229,230,231,1592
97 1180 DATA 232,234,235,236,23
7,239,240,241,1894
CE 1190 DATA 242,244,245,246,24
7,249,250,251,1974
A6 1200 DATA 252,254,128,64,32,
16,8,4,758
98 1210 DATA 2.1,32,84,192,32,1
9,193,555
E3 1220 DATA 189,162,192,17,78,
145,78,32,893
C2 1230 DATA 36,193,96,32,84,19
2,32,19,684
07 1240 DATA 193,189,162,192,73,
255,49,78,1191
BE 1250 DATA 145,78,32,36,193,9
6,32,84,696
C0 1260 DATA 192,32,19,193,189,
162,192,81,1060
F3 1270 DATA 78,145,78,32,36,19
3,96,32,690
BB 1280 DATA 84,192,32,19,193,1
89,162,192,1063
8A 1290 DATA 49,78,32,36,193,20
1,0,96,685
7B 1300 DATA 56,169,199,229,155,
144,21,133,1106
1A 1310 DATA 156,74,74,74,168,1
65,21,74,806
DF 1320 DATA 208,10,165,20,144,

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```

5.44,18,614
5B 1330 DATA 193,208,1,96,32,32,
192,76,830
2E 1340 DATA 72,178,192,72,173,
14,220,41,962
D8 1350 DATA 254,141,14,220,165,
1,41,253,1089
B9 1360 DATA 133,1,104,96,72,16
5,1,9,581
67 1370 DATA 2,133,1,173,14,220,
9,1,553
06 1380 DATA 141,14,220,104,96,
32,253,174,1034
47 1390 DATA 32,235,183,134,155,
96,32,53,920
DF 1400 DATA 193,32,240,192,32,
170,192,96,1147
D6 1410 DATA 32,53,193,32,240,1
92,32,187,961
2E 1420 DATA 192,96,32,53,193,3
2,240,192,1030
7D 1430 DATA 32,206,192,96,0,0,
0,0,526
ED 1440 DATA 103,0,195,165,20,1
66,21,141,811
3F 1450 DATA 96,193,142,97,193,
165,155,141,1182
E2 1460 DATA 98,193,96,173,96,1
93,174,97,1120
B8 1470 DATA 193,133,20,134,21,
173,98,193,965
D3 1480 DATA 133,155,96,230,20,
208,2,230,1074
F8 1490 DATA 21,96,165,20,208,2,
198,21,731
1C 1500 DATA 198,20,96,230,155,
208,2,230,1139
61 1510 DATA 156,96,165,155,208,
2,198,156,1136
9D 1520 DATA 198,155,96,32,215,
193,160,0,1049
50 1530 DATA 177,251,133,20,200,
177,251,133,1342
9E 1540 DATA 21,200,177,251,133,
155,200,145,1282
C7 1550 DATA 251,173,92,193,96,
32,215,193,1245
74 1560 DATA 160,0,165,20,145,2
51,200,165,1106
85 1570 DATA 21,145,251,200,165,
155,145,251,1333
BB 1580 DATA 200,173,92,193,145,
251,96,169,1319
6C 1590 DATA 0,162,200,133,251,
134,252,174,1306
7F 1600 DATA 93,193,202,240,16,
24,165,251,1184
A8 1610 DATA 105,4,133,251,165,
252,105,0,1015
26 1620 DATA 133,252,76,226,193,
96,173,94,1243
A9 1630 DATA 193,16,43,32,99,19
3,173,92,841
AC 1640 DATA 193,48,6,32,147,19
3,76,12,707
4C 1650 DATA 194,32,154,193,165,
155,201,255,1349
A1 1660 DATA 240,66,201,200,240,
62,32,240,1281
40 1670 DATA 192,32,223,192,240,
54,169,0,1102
5E 1680 DATA 141,94,193,76,84,1
94,32,99,913
A0 1690 DATA 193,173,92,193,48,
6,32,147,884
E8 1700 DATA 193,76,55,194,32,1
54,193,165,1062
AF 1710 DATA 155,201,255,240,23,
201,200,240,1515
33 1720 DATA 19,32,240,192,32,2
23,192,208,1138
03 1730 DATA 11,169,128,141,94,
193,238,93,1067
32 1740 DATA 193,32,189,193,32,
115,193,173,1120

```

```

81 1750 DATA 95,193,16,43,32,99,
193,173,844
32 1760 DATA 92,193,16,6,32,147,
193,76,755
E9 1770 DATA 109,194,32,154,193,
165,155,201,1203
AE 1780 DATA 255,240,82,201,200,
240,78,32,1328
A1 1790 DATA 240,192,32,223,192,
240,70,169,1358
B9 1800 DATA 0,141,95,193,76,19
7,194,32,928
74 1810 DATA 99,193,173,92,193,
16,6,32,804
41 1820 DATA 147,193,76,152,194,
32,154,193,1141
49 1830 DATA 165,155,201,255,24,
0,39,201,200,1456
CD 1840 DATA 240,35,32,240,192,
32,223,192,1186
D0 1850 DATA 208,27,169,128,141,
95,193,238,1199
8C 1860 DATA 93,193,173,92,193,
73,128,141,1086
61 1870 DATA 92,193,32,189,193,
173,92,193,1157
32 1880 DATA 73,128,141,92,193,
32,115,193,967
BE 1890 DATA 96,32,53,193,32,20
8,194,96,904
8E 1900 DATA 169,0,141,93,193,1
41,92,193,1022
FC 1910 DATA 169,0,141,94,193,1
41,95,193,1026
B0 1920 DATA 32,240,192,32,223,
192,208,13,1132
E7 1930 DATA 32,138,193,165,20,
37,21,201,807
1B 1940 DATA 255,240,2,208,235,
32,131,193,1296
A2 1950 DATA 32,240,192,32,223,
192,208,19,1138
47 1960 DATA 32,173,192,32,246,
193,32,131,1031
32 1970 DATA 193,165,20,201,64,
208,233,165,1249
DB 1980 DATA 21,240,229,173,93,
193,240,19,1208
61 1990 DATA 32,163,193,206,93,
193,32,240,1152
97 2000 DATA 192,32,223,192,240,
6,173,93,1151
83 2010 DATA 193,208,237,96,76,
216,194,162,1382
CB 2020 DATA 0,160,204,134,78,1
32,79,160,947
98 2030 DATA 0,145,78,200,208,2
51,230,79,1191
5C 2040 DATA 166,79,224,208,208,
243,96,32,1256
C3 2050 DATA 253,174,32,158,183,
138,32,47,1017
AD 2060 DATA 195,96,32,53,193,3
2,223,192,1016
75 2070 DATA 96,0,0,0,0,0,0,0,9
6
E9 2080 DATA-1

```

PROGRAM: HI-RES DEMO

```

46 1 POKE53280,6+8
7B 2 DEFFNR1(X)=INT(RND(1)*264)+5
CE 3 DEFFNR2(X)=INT(RND(1)*144)+5
83 10 SYS49152:REM HIRES
49 11 PRINT"[CLR]"
BA 30 SYS49991.5:REM SET COLOUR
54 50 SYS49216:REM CLEAR GRAPHIC
41 60 FORD=0TO19
2C 70 O1=FNR1(0):O2=FNR2(0):GOSUB
1000 SYS49184:REM LORES
16 80 NEXTD

```



```
C4 100 SYS49865.5,199-5:REM FILL
C0 110 POKE53280,5
OD 120 POKE198,0:WAIT198
,1:POKE198,0:
6A 999 END
10 1000 FORC=0T050
41 1010 SYS49470,01,02+C:REM
PLOT
63 1020 SYS49470,01+C,02:REM
PLOT
21 1030 SYS49470,01+C,02+50:REM
PLOT
51 1040 SYS49470,01+50,02+C:REM
PLOT
DF 1050 NEXTC
A6 1060 RETURN
```

CODE RELOCATION



PROGRAM: CRELOC/BL

```
10 GOTO50000
20089 DATA 10,8,10,0,158,50,48,5
4
20097 DATA 49,0,0,0,32,68,229,16
2
20105 DATA 0,142,133,9,32,173,8,
174
20113 DATA 133,9,189,195,8,240,6
,32
20121 DATA 210,255,232,208,245,2
32,189,195
20129 DATA 8,208,230,32,207,255,
201,13
20137 DATA 208,249,160,0,185,2,5
,201
20145 DATA 48,176,8,201,7,176,39
,105
20153 DATA 9,208,7,56,233,48,201
,10
20161 DATA 176,28,192,1,240,10,1
0,10
20169 DATA 10,10,141,133,9,200,2
08,220
20177 DATA 13,133,9,141,129,9,16
9,0
20185 DATA 141,128,9,76,109,8,23
8,32
20193 DATA 208,76,13,8,234,169,1
36,133
20201 DATA 73,169,9,133,74,173,1
30,9
20209 DATA 133,75,173,131,9,133,
76,160
20217 DATA 0,162,0,177,73,205,13
2,9
20225 DATA 208,14,161,75,24,109,
129,9
20233 DATA 145,73,230,75,208,2,2
30,76
20241 DATA 200,208,2,230,74,204,
130,9
20249 DATA 208,225,165,74,205,13
1,9,208
20257 DATA 218,76,248,8,162,0,18
9,187
20265 DATA 8,240,6,32,210,255,23
2,208
20273 DATA 245,96,13,13,29,29,29
,29
20281 DATA 29,0,42,80,82,79,71,8
2
20289 DATA 65,77,32,82,69,76,79,
67
```

```
20297 DATA 65,84,79,82,42,0,76,6
9
20305 DATA 78,71,84,72,61,32,36,
48
20313 DATA 53,56,51,0,82,69,76,7
9
20321 DATA 67,65,84,69,32,84,79,
58
20329 DATA 36,67,48,48,48,0,0,16
9
20337 DATA 0,133,73,173,129,9,13
3,74
20345 DATA 169,136,133,75,169,9,
133,76
20353 DATA 160,0,177,75,145,73,2
30,73
20361 DATA 208,2,230,74,230,75,2
08,2
20369 DATA 230,76,165,75,205,130
,9,208
20377 DATA 233,165,76,205,131,9,
208,226
20385 DATA 32,173,8,162,0,189,95
,9
20393 DATA 240,6,32,210,255,232,
208,245
20401 DATA 32,228,255,240,251,20
1,89,240
20409 DATA 26,32,173,8,162,0,189
,111
20417 DATA 9,240,6,32,210,255,23
2,208
20425 DATA 245,174,128,9,173,129
,9,32
20433 DATA 205,189,96,108,128,9,
82,85
20441 DATA 78,32,78,79,87,63,32,
40
20449 DATA 89,47,78,41,32,0,83,8
9
20457 DATA 83,32,65,68,68,82,69,
83
20465 DATA 83,32,73,83,58,32,0,0
20473 DATA 0,11,15,19,0,0,0,76
20481 DATA 74,19,169,0,141,65,19
,173
20489 DATA 57,19,133,73,173,58,1
9,133
20497 DATA 74,160,0,177,73,205,6
5,19
20505 DATA 240,23,230,73,208,2,2
30,74
20513 DATA 165,73,205,59,19,208,
236,165
20521 DATA 74,205,60,19,208,229,
76,56
20529 DATA 19,238,65,19,208,209,
24,96
20537 DATA 0,192,16,192,16,192,0
,96
20545 DATA 0,173,57,19,133,73,13
3,75
20553 DATA 173,58,19,133,74,173,
64,19
20561 DATA 133,76,160,0,177,73,2
09,75
20569 DATA 240,3,32,129,19,200,2
08,4
20577 DATA 230,74,230,76,165,74,
205,60
20585 DATA 19,208,233,204,59,19,
208,228
20593 DATA 173,180,19,24,109,59,
19,141
20601 DATA 61,19,165,78,141,62,1
9,96
20609 DATA 173,179,19,208,13,238
,179,19
20617 DATA 173,59,19,133,77,173,
60,19
20625 DATA 133,78,177,73,72,173,
65,19
20633 DATA 145,73,140,181,19,104
,56,237
20641 DATA 58,19,172,180,19,145,
```

```
77,172
20649 DATA 181,19,238,180,19,208
,2,230
20657 DATA 78,96,0,0,0,162,0,189
20665 DATA 41,19,240,6,32,210,25
5,232
20673 DATA 208,245,96,169,147,32
,210,255
20681 DATA 162,0,142,181,19,32,1
82,19
20689 DATA 174,181,19,189,49,19,
240,6
20697 DATA 32,210,255,232,208,24
5,232,189
20705 DATA 49,19,208,230,96,169,
0,141
20713 DATA 39,19,162,6,142,40,19
,160
20721 DATA 25,24,32,240,255,32,2
07,255
20729 DATA 240,251,174,39,19,238
,39,19
20737 DATA 157,237,19,201,13,208
,238,174
20745 DATA 40,19,232,232,224,12,
144,220
20753 DATA 96,32,196,19,32,230,1
9,162
20761 DATA 88,32,203,19,32,228,2
55,240
20769 DATA 251,201,78,240,236,96
,0,0
20777 DATA 13,13,29,29,29,29,29,
0
20785 DATA 29,29,29,29,29,29,18,
65
20793 DATA 76,76,32,73,78,80,85,
84
20801 DATA 32,73,78,32,72,69,88,
146
20809 DATA 17,17,0,83,84,65,82,8
4
20817 DATA 32,79,70,32,65,83,83,
69
20825 DATA 77,66,76,89,49,58,0,8
3
20833 DATA 84,65,82,84,32,79,70,
32
20841 DATA 65,83,83,69,77,66,76,
89
20849 DATA 50,58,0,69,78,68,43,4
9
20857 DATA 32,79,70,32,65,83,83,
69
20865 DATA 77,66,76,89,49,58,0,0
20873 DATA 65,82,69,32,89,79,85,
32
20881 DATA 83,85,82,69,32,89,47,
78
20889 DATA 0,0,76,79,79,75,73,78
20897 DATA 71,32,70,79,82,32,77,
65
20905 DATA 82,75,69,82,0,0,77,65
20913 DATA 82,75,69,82,32,70,79,
85
20921 DATA 78,68,32,45,32,80,82,
69
20929 DATA 80,65,82,73,78,71,32,
80
20937 DATA 82,79,71,82,65,77,0,0
20945 DATA 77,65,82,75,69,82,32,
78
20953 DATA 79,84,32,70,79,85,78,
68
20961 DATA 32,45,32,69,88,73,84,
73
20969 DATA 78,71,0,0,65,66,67,68
20977 DATA 13,69,70,65,66,13,49,
50
20985 DATA 51,52,13,160,0,189,23
7,19
20993 DATA 232,201,13,240,246,20
1,64,176
21001 DATA 6,56,233,48,76,18,19,
233
```


LISTINGS

```

21009 DATA 55.192.1.240.6.141.66
21017 DATA 200.208.226.14.66.19.
14.66
21025 DATA 19.14.66.19.14.66.19.
13
21033 DATA 66.19.96.162.0.160.0.
140
21041 DATA 67.19.32.252.19.172.6
7.19
21049 DATA 153.68.19.200.192.6.2
08.239
21057 DATA 96.0.0.0.0.0.0.0
21065 DATA 0.216.32.18.19.32.44.
19
21073 DATA 32.121.19.32.68.229.1
62.106
21081 DATA 32.203.19.32.3.19.176
.6
21089 DATA 162.160.32.203.19.96.
162.126
21097 DATA 32.203.19.32.66.19.32
.220
21105 DATA 19.32.158.19.32.59.19
.96
21113 DATA 173.69.19.141.57.19.1
73.68
21121 DATA 19.141.58.19.173.71.1
9.141
21129 DATA 63.19.173.70.19.141.6
4.19
21137 DATA 173.73.19.141.59.19.1
73.72
21145 DATA 19.141.60.19.96.173.5
7.19
21153 DATA 160.0.56.233.135.133.
73.141
21161 DATA 248.19.173.58.19.233.
1.133
21169 DATA 74.141.249.19.169.250
.133.75
21177 DATA 169.19.133.76.177.75.
145.73
21185 DATA 230.73.208.2.230.74.2
30.75
21193 DATA 208.2.230.76.165.74.2
05.58
21201 DATA 19.208.233.165.73.205
.57.19
21209 DATA 208.226.96.173.59.19.
56.237
21217 DATA 57.19.141.57.19.173.6
0.19
21225 DATA 237.58.19.141.58.19.1
69.136
21233 DATA 24.109.57.19.141.123.
19.169
21241 DATA 9.109.58.19.141.124.1
9.162
21249 DATA 0.173.58.19.41.240.74
.74
21257 DATA 74.74.24.105.48.201.5
8.144
21265 DATA 3.24.105.7.157.217.19
.232
21273 DATA 224.4.240.21.224.1.20
8.8
21281 DATA 173.58.19.41.15.76.11
.19
21289 DATA 173.57.19.224.2.240.2
13.208
21297 DATA 242.173.65.19.141.125
.19.96
21305 DATA 0.0.162.0.189.199.19.
240
21313 DATA 6.32.210.255.232.208.
245.162
21321 DATA 0.32.207.255.240.251.
201.13
21329 DATA 240.8.157.183.19.232.
224.13
21337 DATA 208.239.224.0.240.220
.142.197
21345 DATA 19.162.0.189.221.19.2
40.6
21353 DATA 32.210.255.232.208.24
5.32.207
21361 DATA 255.240.251.201.13.24
0.5.141
21369 DATA 198.19.208.242.173.19
8.19.56
21377 DATA 233.48.201.1.240.4.20
1.8
21385 DATA 208.176.170.169.1.160
.0.32
21393 DATA 186.255.173.197.19.16
2.183.160
21401 DATA 19.32.189.255.173.248
.19.133
21409 DATA 73.173.249.19.133.74.
169.73
21417 DATA 174.61.19.172.62.19.2
32.208
21425 DATA 1.200.32.216.255.96.3
2.32
21433 DATA 32.32.32.32.32.32.32.
32
21441 DATA 32.32.32.32.0.0.13.17
21449 DATA 17.17.17.29.29.80.82.
79
21457 DATA 71.82.65.77.32.78.65.
77
21465 DATA 69.58.32.0.13.17.17.2
9
21473 DATA 29.79.85.84.80.85.84.
32
21481 DATA 68.69.86.73.67.69.32.
40
21489 DATA 49.47.56.41.58.32.0.0
21497 DATA 0.10.8.10.0.158.50.48
21505 DATA 54.49.0.0.0.32.68.229
21513 DATA 162.0.142.133.9.32.17
3.8
21521 DATA 174.133.9.189.195.8.2
40.6
21529 DATA 32.210.255.232.208.24
5.232.189
21537 DATA 195.8.208.230.32.207.
255.201
21545 DATA 13.208.249.160.0.185.
2.5
21553 DATA 201.48.176.8.201.7.17
6.39
21561 DATA 105.9.208.7.56.233.48
.201
21569 DATA 10.176.28.192.1.240.1
0.10
21577 DATA 10.10.10.141.133.9.20
0.208
21585 DATA 220.13.133.9.141.129.
9.169
21593 DATA 0.141.128.9.76.109.8.
238
21601 DATA 32.208.76.13.8.234.16
9.136
21609 DATA 133.73.169.9.133.74.1
73.130
21617 DATA 9.133.75.173.131.9.13
3.76
21625 DATA 160.0.162.0.177.73.20
5.132
21633 DATA 9.208.14.161.75.24.10
9.129
21641 DATA 9.145.73.230.75.208.2
.230
21649 DATA 76.200.208.2.230.74.2
04.130
21657 DATA 9.208.225.165.74.205.
131.9
21665 DATA 208.218.76.248.8.162.
0.189
21673 DATA 187.8.240.6.32.210.25
5.232
21681 DATA 208.245.96.13.13.29.2
9.29
21689 DATA 29.29.0.42.80.82.79.7
1
21697 DATA 82.65.77.32.82.69.76.
79
21705 DATA 67.65.84.79.82.42.0.7
6
21713 DATA 69.78.71.84.72.61.32.
36
21721 DATA 48.52.48.48.0.82.69.7
6
21729 DATA 79.67.65.84.69.32.84.
79
21737 DATA 58.36.67.48.48.48.0.0
21745 DATA 169.0.133.73.173.129.
9.133
21753 DATA 74.169.136.133.75.169
.9.133
21761 DATA 76.160.0.177.75.145.7
3.230
21769 DATA 73.208.2.230.74.230.7
5.208
21777 DATA 2.230.76.165.75.205.1
30.9
21785 DATA 208.233.165.76.205.13
1.9.208
21793 DATA 226.32.173.8.162.0.18
9.95
21801 DATA 9.240.6.32.210.255.23
2.208
21809 DATA 245.32.228.255.240.25
1.201.89
21817 DATA 240.26.32.173.8.162.0
.189
21825 DATA 111.9.240.6.32.210.25
5.232
21833 DATA 208.245.174.128.9.173
.129.9
21841 DATA 32.205.189.96.108.128
.9.82
21849 DATA 85.78.32.78.79.87.63.
32
21857 DATA 40.89.47.78.41.32.0.8
3
21865 DATA 89.83.32.65.68.68.82.
69
21873 DATA 83.83.32.73.83.58.32.
0
21881 DATA 0.0.0.0.0.0.0.0
21889 DATA 247.247.2.0.0.0.0.0
21897 DATA 0.0.0.0.0.0.0.0
21905 DATA 0.0.0.0.0.0.0.0
21913 DATA 0.0.0.0.0.0.0.1
21921 DATA 0.0.0.1.1.1.1.1
21929 DATA 1.1.1.0.0.0.1.2
21937 DATA 2.2.2.2.2.2.2.1
21945 DATA 2.2.1.2.2.0.0.0
21953 DATA 0.0.2.2.3.2.0.2
21961 DATA 0.2.0.2.0.2.0.2
21969 DATA 0.0.3.0.3.3.0.0
21977 DATA 0.0.3.0.0.3.3.5
21985 DATA 3.5.3.4.3.3.3.0
21993 DATA 5.3.3.3.3.3.3.3
22001 DATA 3.3.3.0.0.0.256
50000 M=2049:PRINT"(CLR)(DOWN)(D
OWN)(RGHT)(RGHT)(RGHT)(RVS)LOCAT
ION:(OFF)"
50010 FORL=0TO1:L=0
50020 READV:IFV=256THENL=1:GOTO5
0050
50030 POKEM,V:PRINT"(HOME)(DOWN)
(DOWN)(RGHT)(RGHT)(RGHT)(RGHT)(R
GHT)(RGHT)(RGHT)(RGHT)(RGHT)(RGH
T)(RGHT)(RGHT)";M
50040 M=M+1
50050 NEXT
50060 INPUT"(CLR)(DOWN)(DOWN)(DO
WN)(RGHT)(RGHT)FILENAME";F$
50070 INPUT"(DOWN)(DOWN)(RGHT)(R
GHT)TAPE(T)/DISC(D)";O$
50080 IFF$=">"ORO$(">")T"ANDO$(">")D"
THEN50060
50085 O=1*ABS(O$="T")+8*ABS(O$="
D")
50090 PRINT"(CLR)(DOWN)(DOWN)SAV
E"CHR$(34):F$:CHR$(34);";":O
50094 H=INT(M/256):L=M-H*256:POK
E252,L:POKE253,H
50095 POKE46,PEEK(253):POKE45,PE
EK(252)
50100 POKE631,13:POKE198,1:PRINT
""

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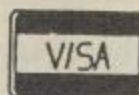
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Bug Finder

We'd like to remind our readers that we run a Bug Finder service.

If you have typed in one of our programs and despite much checking, you still can't get it to run, then send us the following:

Two copies of your program on tape or disk.

A description of your problem.

If possible a listing of your work (you may omit this).

A stamped, self-addressed envelope for return of the program to you.

Should any of the above be missing then we will not be able to deal with your query.

We will try to point out where you have made errors and place a corrected copy of the program back on to your tape or disk before we return it to you.

Do not send a program to us as soon as it stops working, please check it several times first.

We do get a large number of queries and so it may take a while for us to deal with yours personally.

Note: we can only deal with problems relating to programs published in *Your Commodore*.

At the *Your Commodore* office we receive hundreds of letters from readers every month. We do try and answer each individually but sometimes this is impossible due to pressure of work. If you have written to us and not received a personal reply, we apologise for this but we cannot promise to reply to every item of mail we receive. If you feel that your question or letter really needs an answer, then inclusion of an s.a.e. will guarantee a reply, although this may still take time to arrive.

Commodore Where Are You?

At the *Your Commodore* office we are repeatedly asked for the address and telephone number of Commodore U.K. Many people, after referring to their computer manuals, believe them to be based in Corby.

The Commodore plant at Corby was closed down some time ago. Reproduced here you will find the correct address for Commodore U.K.

We suggest that you write this correct address in the front of your computers manual for future reference.

Commodore Business Machine, (UK),
Commodore House,
The Switchback,
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Competition Winners

At last the eagerly awaited result of the **Micronet** competition which we ran in the May issue. And the winner of the highly acclaimed ProPak which comprises the Telemat modem and software is Bruce Belton of Henfield, Sussex. Congratulations Bruce!

We have a Scottish winner for the June **Board Game** competition. Brian Graham of Ayr wins The Colossus Series which comprises Chess, Bridge and Maj Jong. The ten runners up will each receive a Maj Jong set – read on and see if it's you;

David Fairweather, Blackburn; A. Betesta, Derby; M.R. Eyres, Co. Galway; P. Moisejeus, Swindon; K. Patel, Crawley; Allan Parker, Huntingdon; G. Patel, Surrey; Dixie Dean, Littlehampton; J. Hicks, Redditch; Dave Parish, West Wickham.

The three lucky winners of the **Graphics** competition which we ran in the July issue are Michael Suchoruczka, Nottingham; M. Moore, Ipswich; J. Davey, Torquay. They will all receive a graphics package comprising Photo Finish, Billboard Maker, Icon Factory, Screen F/X and Clipart from Financial Systems Software. The seven runners up will each receive a copy of the popular F/X package. They are: R.H. Underwood, Surbiton; Eugene Morgan, C. Down; A. Haddon, Nottingham; G.G. Brown, Tyne & Wear; M.J. New, Canterbury; Sean Whelan, Plumstead; G. Snowling, Sudbury.

Puzzle Corner

PUZZLE CORNER

Another simple one this month. Imagine that there are nine dots arranged in a 3 x 3 grid (see diagram).



All you have to do is join all the dots using just four straight lines. The only snag is that each new line must start where the old one finishes.

Send entries to, *Grid Puzzle*, Your Commodore, A.S.P. Ltd, 1 Golden Square, London W1R 3AB.

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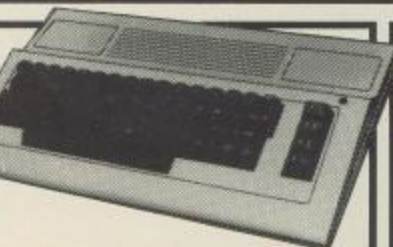
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DISC DISECTOR V5.0 Disk backup/utility package featuring wide range of powerful programs. Compatible with 64/128/128D and 1541/1570 disk drives £19.95
1541 PHYSICAL EXAM Consists of digital alignment disk and drive fault diagnosis software to check and correct 1541 head alignment. Includes quiet drive stops £39.95
1541 QUIET DRIVE STOPS Silences 'knocking' noise with 1541 drives (not suitable for 'turn lever' type drives) £4.95

DATA RECORDER CBM compatible, same as C2N/1531 but cheaper and includes pause control button £24.95
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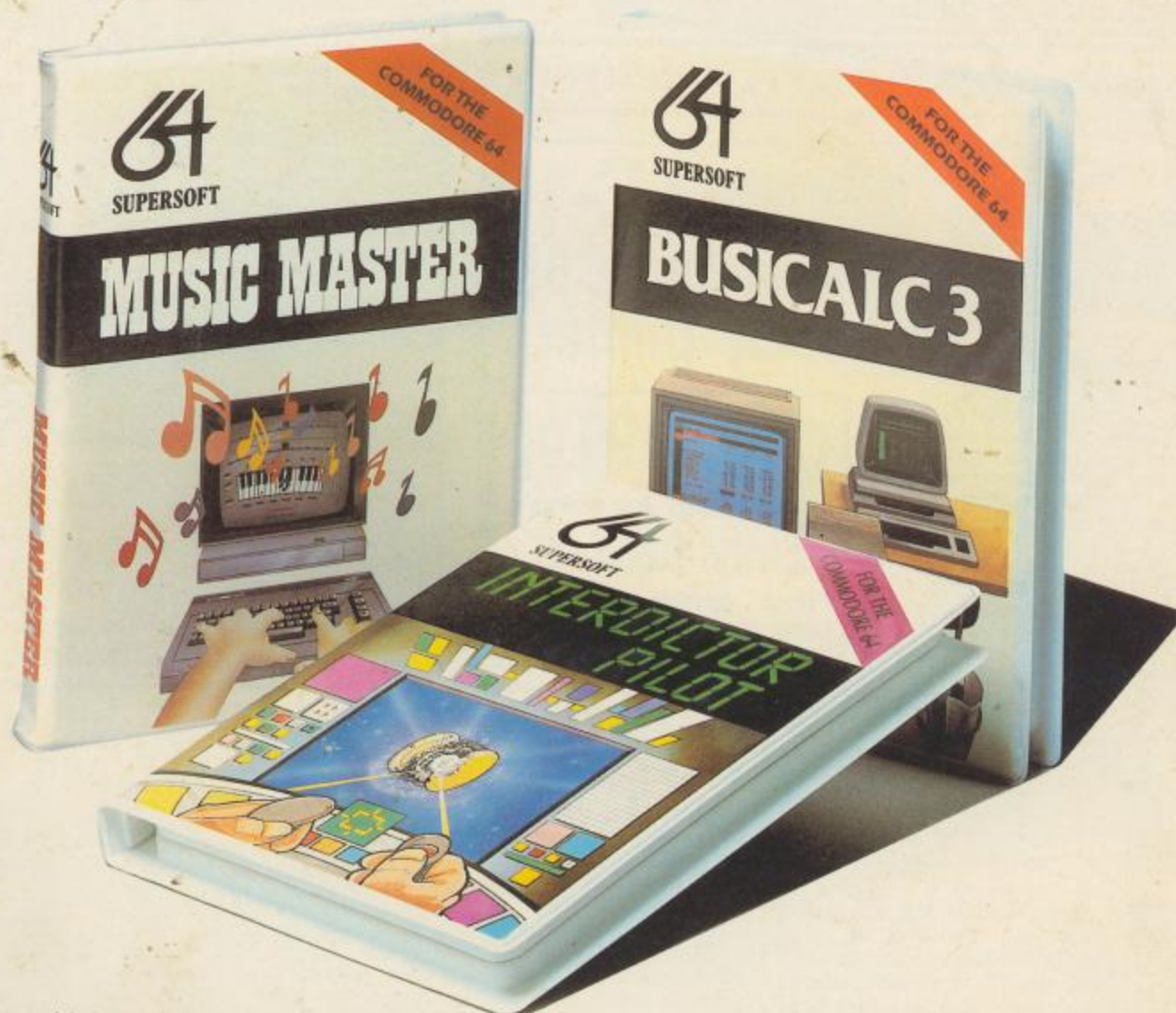
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COMMODORE

OCTOBER 1988

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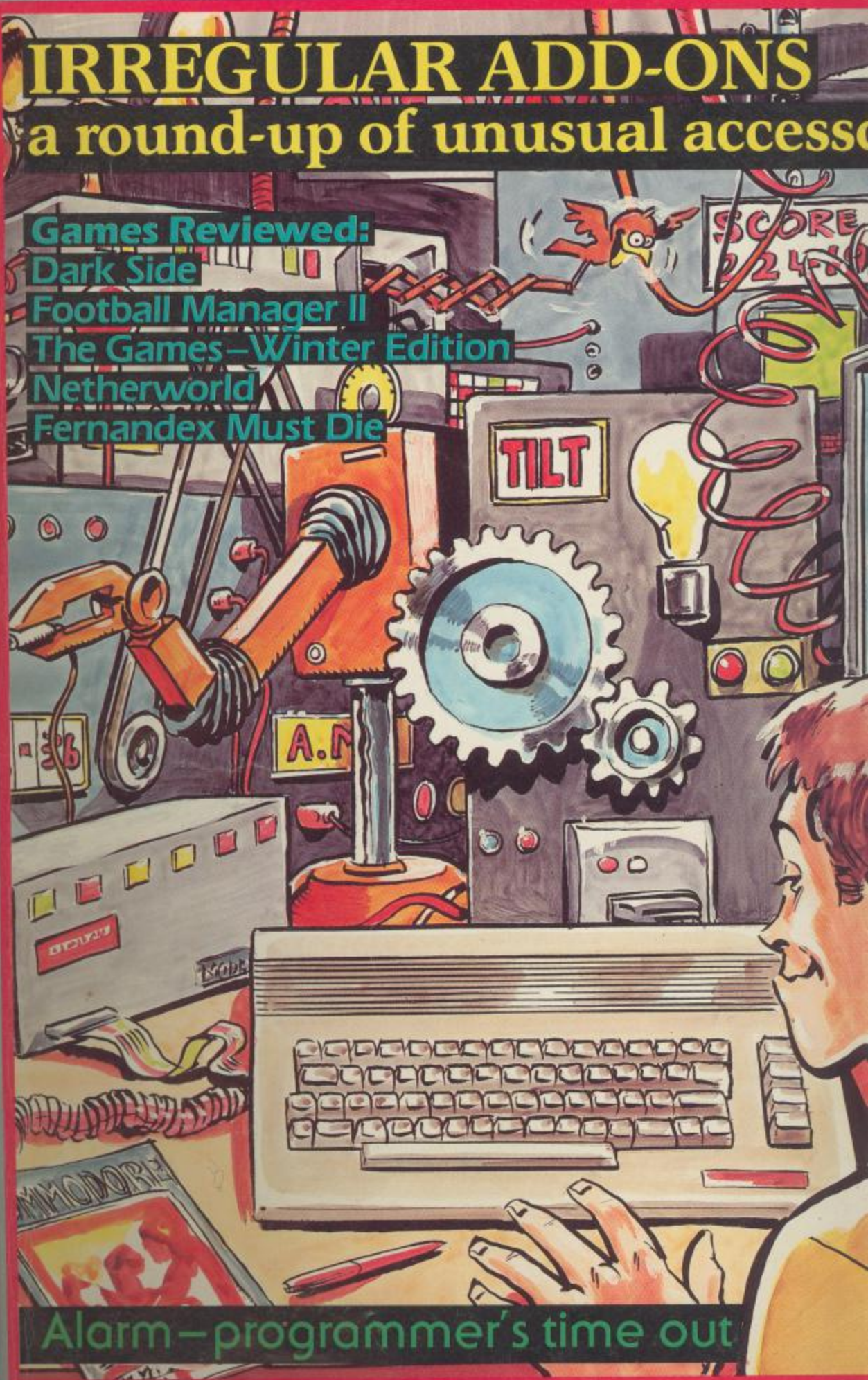
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